

RESULTS OF THE KYOTO UNIVERSITY  
SCIENTIFIC EXPEDITION  
TO THE KARAKORAM AND HINDUKUSH, 1955, Vol. IV

INSECT FAUNA OF AFGHANISTAN  
AND HINDUKUSH

Edited by  
MASUZO UÉNO



THE COMMITTEE OF THE KYOTO UNIVERSITY SCIENTIFIC  
EXPEDITION TO THE KARAKORAM AND HINDUKUSH  
KYOTO UNIVERSITY, JAPAN

1963

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## EDITORIAL NOTE

THE results of the Kyoto University Scientific Expedition to the Karakoram and Hindukush, 1955, will be published in seven separate volumes dealing with the botanical, zoological, anthropological, and geological aspects of the Expedition. The volumes II and VI have been published, and the present volume (Vol. IV) contains the results of the entomological collections. Further volumes will be issued as soon as the other investigations will be completed.

The present volume has been published by the help of the Fauna and Flora Research Society, Kyoto University, through the financial assistance from the Asahi Press.

Kyoto, Japan

January 31, 1963

K. H.

## PREFACE

THE present volume consists of ten articles dealing with the insect fauna of Afghanistan and Hindukush, as well as West Pakistan and Iran. The zoological collection made by the expedition sent to Karakoram and Hindukush from Kyoto University in 1955 was not extensive, being restricted to some particular groups of insects easy to collect, because no special arrangement of zoologist as the staff was made in organizing the Expedition whose chief aims were botanical, anthropological and geological. The Committee of the Kyoto University Scientific Expedition to Karakoram and Hindukush was, however, fortunate to receive a number of collections of insects which were made by two additional expeditions, i.e. those by Messrs. YOSHIBA and AZUMA in Pakistan and Iran during their Punjab Himalaya Expedition in 1956, and also those by Messrs. OGINO and IWATSUBO in the Swat Himalaya Expedition in 1957. The Committee has decided to undertake the studies of those collections came from two different sources other than that from the Expedition in 1955 and to publish the reports of them, supplemented to the original records (1955), in the present volume.

The articles in the present volume comprise by no means various groups of insects in the districts under consideration, but, I believe, they will offer useful materials for the knowledge of the insect fauna of Afghanistan and its adjacent districts, where there are defectively investigated with regard to the insect fauna up to the present day.

On behalf of the Committee of the Kyoto University Scientific Expedition to Karakoram and Hindukush, I wish to express my cordial thanks to the contributors who have studied the materials and have prepared the reports for this volume. Special thanks are due to Professor Joji ASHIDA, President of the Fauna and Flora Research Society, Kyoto University, and to Professor Kōsuke YAMASHITA, one of the staff of the Expedition in 1955, for their kind advice and assistance of many kinds. I also gratefully acknowledge the Asahi Press, whose financial help has made it possible to carry on the preparation for publication.

Kyoto, Japan

February 1963

M. UÉNO

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ARTICLE I | YOSII: COLLEMBOLA



# I.

## On some Collembola of Hindukush, with notes on *Isotoma* BOURLET and its allies

(26 text-figures)

Riozo YOSII\*

The collembolan materials treated in the present paper are from two sources. Those of Afghanistan are the collection of As. Prof. T. UMESAO in his journey in 1955, while those from West Pakistan are collected by Mr. K. YOSHIBA during his mountaineering throughout the Swat District in 1957. I must, therefore, express my hearty thanks to the above-mentioned colleagues for their efforts. In the year 1960 I myself have made a tour through Afghanistan as a member of the Climbing Party of Mt. Noshaq (7,490 m.) undertaken by A. A. C. K. and collected some further materials, whose results are to be given in my next paper. During the study I have had the necessity to compare these species with some Japanese and European forms of the same genera. Such results are given in the second part of the present work.

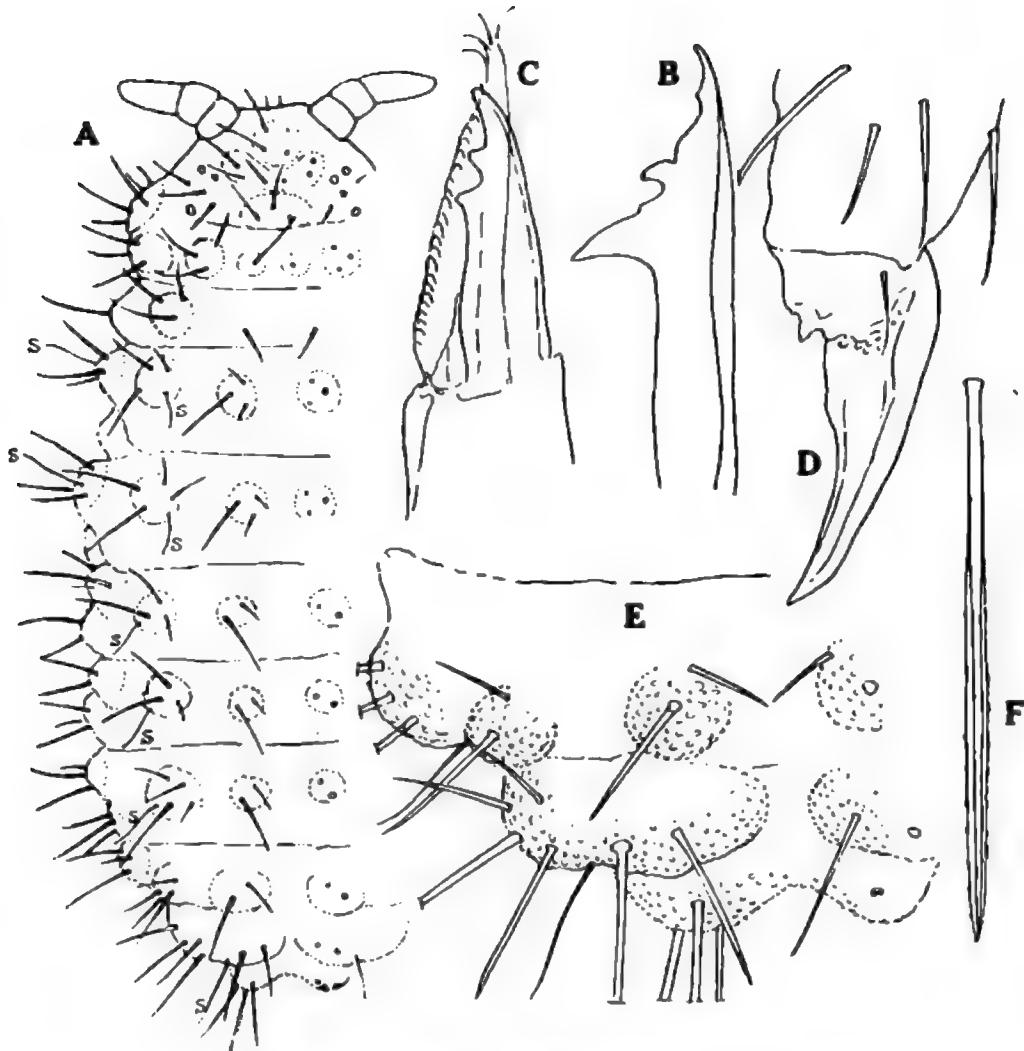
### 1. *Lobella yoshibai* sp. n. (Fig. 1)

5 expl. Dumiyal (4,000 m. alt.), Swat, Pakistan, 8. IX 1956, K. YOSHIBA leg.

2 expl. Shanie, Swat, Pakistan, 11. IX 1956, K. YOSHIBA leg.

Body length 1.8 mm. Colour orange yellow in living (after YOSHIBA's note) and white in alcohol. Antennae shorter than head. Ant. I with a dorsal tubercle having 4 setae in a row. Ant. II has also one rounded tubercle and some setae in one row. Ant. IV is dorsally confluent with III and provided with many curving slender sensory setae. Distal end has trilobed end bulb. Ant. III-organ is small, in a deep groove and accompanied by one slender sensory seta on dorsal side. Tubercles of the head feeble, but typically distributed. Clypeal tubercle (cf. YOSII 1956) has 2+2 setae. Antennal tubercle is directly before the median tubercle. The latter has 3 setae. Ocular tubercle has 3 subequal setae. Eyes 3+3, slightly pigmented. Postantennal field, a smooth rounded field alike to the fovea, is to be seen. Setae of the occipital tubercles as 1, 3, 3. Lateral and sublateral tubercles of the row are fused and with many setae. Buccal cone moderately protruded. Mandible is reduced, hyaline and with 3 principal teeth. Maxilla is, on the contrary, well developed, the shaft is distally with 3 teeth and accompanied with a thin broad lamella, which is surpassing the shaft and minutely fringed on outer margin. Dorsal

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**Fig. 1.** *Lobella yoshibai* sp. n.

A: Dorsal view; B: Mandible; C: Maxilla; D: Fore claw;  
E: Abd. IV-VI; F: Larger body setae from abd. III.

tubercle of th. I is absent, represented by one seta. Th. II, III with setae as 3, s+3, 3+s, 0, i.e. the subcoxal tubercle has no seta at all. Upon abd. I-III setae are as 2, 3+s, 2, 2 and setae upon abd. IV are as 2, 2+s, 3, the lateral tubercle is not to be observed dorsally. Dorsal tubercle of abd. V is almost fused with the lateral one, leaving a slight furrow of the integument between them. Abd. VI is half concealed by abd. V and with a pair of hemispherical tubercle. All segmental tubercles are spherical, finely granulated and not divided into fields. All body setae are yellowish, lightly alate distally and slightly serrated. Unguis is dorsally keeled, ventrally neither granulated nor striated. Inner tooth absent. Furcal rest is a median rounded field with 2+2 setae.

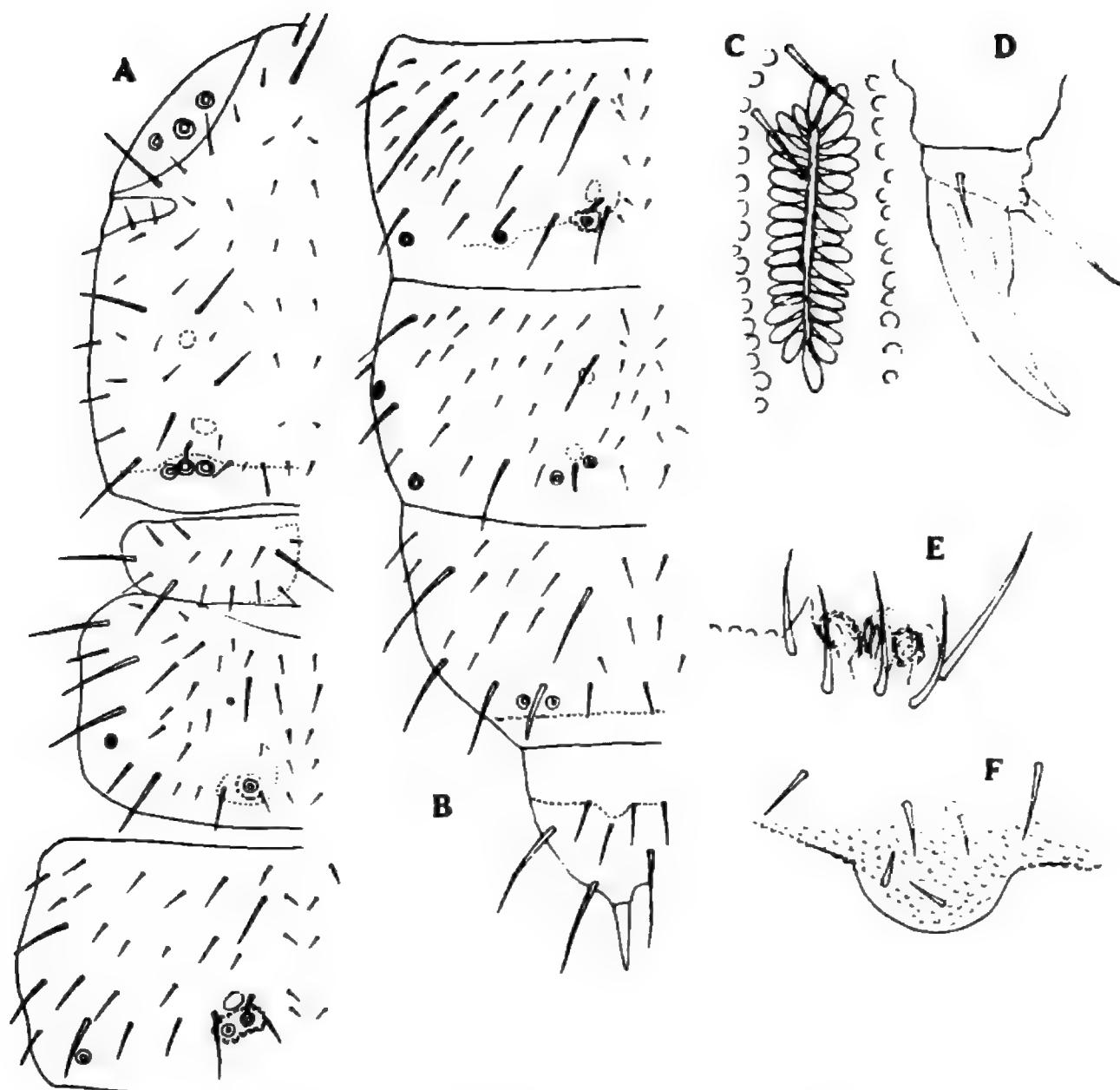
The species is characterized by the reduction of mandible and by the tubercles on abd. V.

## 2. *Onchiurus* cf. *nemoratus* GISIN (Fig. 2)

GISIN 1952

3♀, 2 juv. sunny meadow in Handis, Swat, Pakistan, 6. X 1956, K. YOSHIBA leg.

Body length 1.3 mm. White. Sensory bulb of ant. III-organ is granulated and slightly inclined to one side. Postantennal organ composed of ca. 35 simple narrow elements, arranged transverse to the long axis of the organ and each of them are



**Fig. 2. *Onychiurus* cf. *nemoratus* GISIN**

A, B: Chaetotaxy of the body; C: Postantennal organ;  
D: Hind claw; E: Ant. III-organ; F: Furcal rest.

touching to the other. Unguis normal, usually without, but rarely with a faint sign of an inner tooth. Unguiculus setaceous, without basal lamella and ca. 3/4 the length of unguis. Tenent hair absent. Furcal rest is a small median area, less granulated and with 1+1 setae. Anal opening is T-form. Lateral lobe of the anus has 2 setae larger than others. Anal spines strong, curving and upon papillae, which are somewhat apart to each other. Basal half of ant. III coarser granulated and somewhat thicker. The middle part of ant. II and the proximal half of ant. I are also coarsely granulated. Pseudocelli are located as 3, 3/0, 2, 2/3, 3, 3, 4, 2. Upon head *basis antennalis* is well limited. Almost all setae upon head are of equal length with the exception of larger  $a_0$  and some 5 pairs from the side. Three pairs of pseudocelli of the posterior margin of the head are located between  $P_{4-5}$ , in the shallow incurving of the minutely granulated area, accompanied by a small s-seta directly before them.  $p_3 < p_4 < p_5$ . Th. I has a median furrow, setal arrangement variable, as (i 4 m, i 3 m) (i 4 m, i 4 m) (i 3-, i 3 m) (-1-, -1-) (-2-, i 1 m), of which the last two examples are juvenile. Th. II, III have median 5 pairs of setae,  $a_1$  and

$b_1$  are larger,  $b_2$  large.  $Pso_1$  between  $b_2-c_2$ .  $p_6$  large.  $Pso_2$  is laterally located. Abd. I, II: medially with 4–5 pairs of small setae,  $pso_1$  and  $pso_2$  have a common coarsely granulated area, together with one s-seta and small fovula.  $b_2$  large.  $Pso_3$  is laterally placed and posterior to a large sensory seta ( $p_5$ ). Abd. III is not much different from abd. I, II, but  $pso_2$  is far apart from  $pso_1$  and near  $p_8$ , whose granulated area is not much modified.  $Pso_3$  is lateral to  $p_5$ . Abd. IV has more number of median group of setae.  $Pso_1$  between  $p_{2-3}$ , accompanied by a fovula.  $Pso_2$  between  $p_{3-4}$ .  $Pso_3$  laterally near  $p_7$ .  $Pso_4$  is by far to the side at about the middle of the segment.  $p_4 < p_5$ . A fovula is post. lat. to  $b_2$ . Abd. V has 4 paired and an unpaired ( $p_0$ ) median group of setae.  $b_2$  large.  $Pso_{1,2}$  are located near the large  $p_3$ , which represents s-seta. Marginal structure of the segment very conspicuous along the posterior end. Abd. VI has the proximal half covered with coarser granules as in *O. pseudarmatus* (cf. YOSII 1956).  $a_0$  absent.  $p_0$  large.  $p_1$  is near a-row, being proximally dislocated. Ventral side of head with 1+1 pseudocelli. Ventral tube with 6+6 setae.

The form is very near *O. nemoratus* GISIN 1952 of Europe, but inner tooth of the unguis is almost invisible in the present material.

### 3. *Isotoma* (s. str.) *decorata* BROWN

20 expl. Herat, Afghanistan, 22. IX 1955, T. UMESAO leg.

See the succeeding pages.

Distribution: Mesopotamia, Palestine, Soviet Turkestan, Afghanistan and Pakistan.

### 4. *Isotoma* (s. str.) sp.

6 expl. Under stones in snow, Naltar Pass (5,000 m. alt.), NW.District, Pakistan, 13. IX 1957, K. YOSHIBA leg.

See the notes under *Isotoma innominata* B in the succeeding pages.

### 5. *Desoria* sp.

2 expl. on the small glacier (4,500 m. alt.) near Handis, Swat, Pakistan, 30. IX 1957, K. YOSHIBA leg.

They are juvenile examples nearly related to *Desoria intermedia* (SCHÖTT). Generic character of *Desoria* is discussed in later pages.

### 6. *Isotomurus* sp.

2 expl. Taiwarra, Afghanistan, 3. IX 1955, T. UMESAO leg.

See *Isotomurus innominatus* A in later pages.

### 7. *Entomobrya obscurella* BROWN (Fig. 3)

BROWN 1926, HANDSCHIN 1942

14 expl. Herat, Afghanistan, 22. IX 1955, T. UMESAO leg.

8 expl. Taiwarra, Afghanistan, 3. IX 1955, T. UMESAO leg.

Afghanistan examples coincide well with the description of HANDSCHIN (1942).

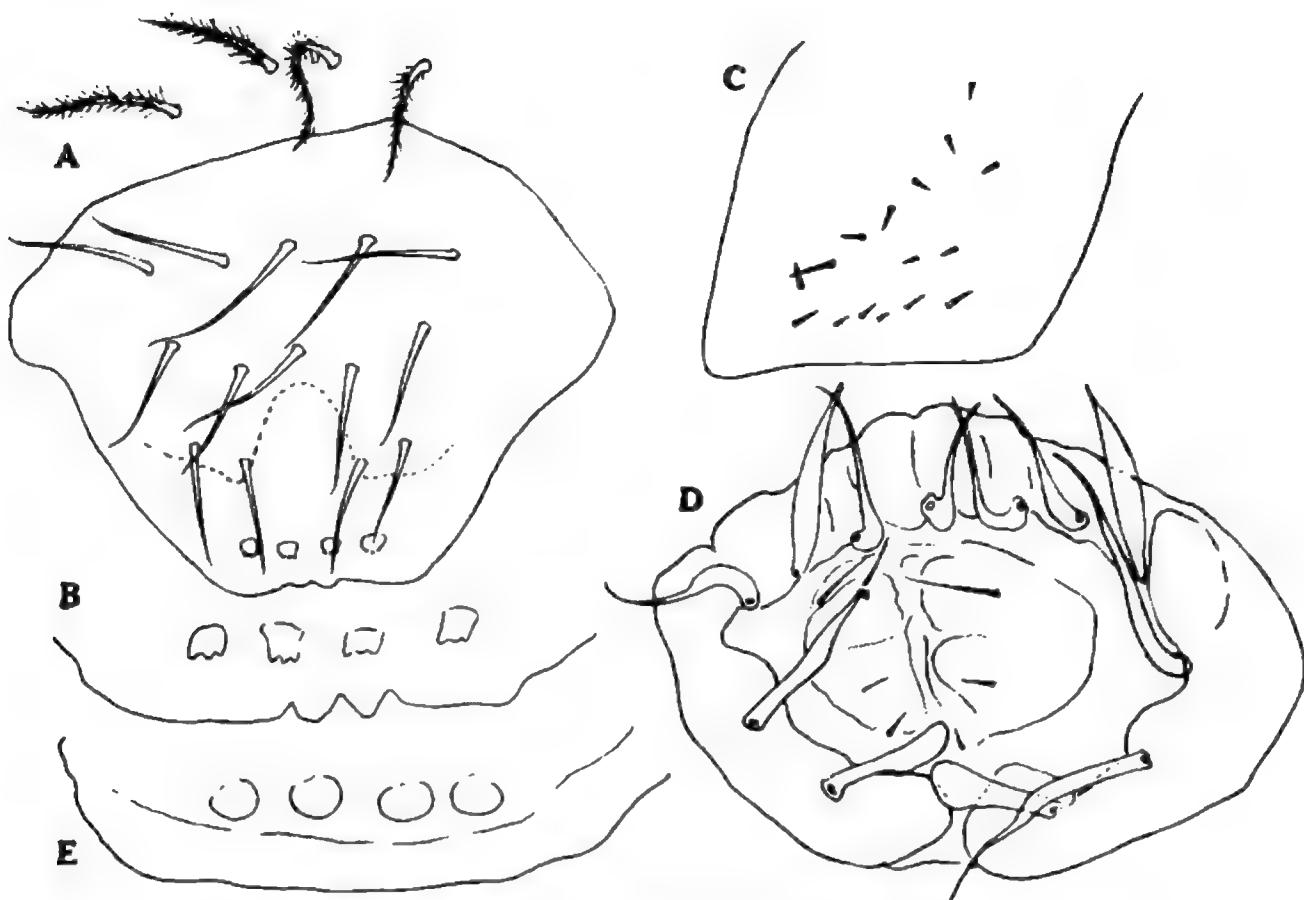


Fig. 3. *Entomobrya obscurella* BROWN

A: Labrum; B: Labral margin; C: Trochanteral organ

D: Male genital area; E: Labral margin of *E. nivalis* (L.) from London

in colour pattern of the body. 4 examples of f. *pallida* HANDSCHIN (1942), 10 examples of f. *intermedia* HANDSCHIN (1942) and others of f. *principalis* are detected. The following notes are to be added: Prelabral setae 2+2, intensely feathered. Labral setae 5, 5, 4, all simple. Labral surface is minutely granulated, but distally smooth and the boundary of these areas is deeply incurved median between the inner distal setae. Near the anterior margin there are 2+2 small papillae, quadrangular in shape and with some 3 minute dentation upon it. Interior face of the labral margin has a pair of narrow elliptical trabeculae (thickening of the chitinous integument) and rough serration is to be observed on their surface. Trochanteral organ composed of ca. 20 minute spiny setae in a triangle. As almost all of them were not yet fully mature, male genital field is investigated only in two examples. It is encircled by a papillate ring. Peripheral setae are well differentiated. A basal pair of them are spathulate distally, then follow two very elongated and cuneated setae. The fourth pair is hyaline, broadly lanceolate and blade-like. The dorsal two pairs are smaller and cuneated.

**Distribution:** Mesopotamia, Palestine and Afghanistan (nov.)

In this occasion I have studied the labrum of the genotypical species *E. nivalis* (L.) from London, England (P. N. LAWRENCE leg.) and Liège, Belgium (F. CARPENTIER leg.). It is alike to that of *E. obscurella* here described, but prelabral setae are only feebly feathered and the 2+2 papillae of the labral margin are rounded, without dentations (Fig. 3 E). This result is not in good accord with that of CHRISTIANSEN 1958 (pl. 2, fig. 10), who has described secondary papillae

upon it. Further studies are needed.

#### 8. *Drepanosira ornata* (BONET) (Fig. 4)

*Parasira ornata*: BONET 1930

*Parasira subornata*: DENIS 1936

*Drepanosira subornata*: BAIJAL 1955

*Drepanosira ornata*: STACH 1960

Of this interesting form of Collembola a well-detailed study was already made by STACH 1960. The following notes are added: Prelabral setae 2+2, lightly serrated on all sides. Labral setae 5, 5, 4, the first two rows slender, those of the third row thicker and the inner pair of them are larger than the outer ones. Boundary of granulated and smooth area is not well defined. Along the labral margin 2+2 stout setae, each with small basal papillae are characteristic of the species.

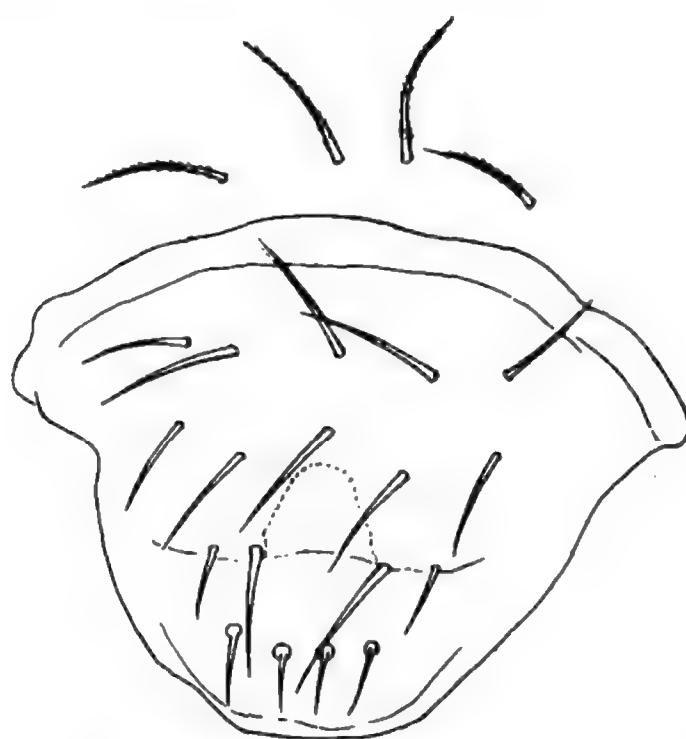


Fig. 4. *Drepanosira ornata* (BONET) Labrum

Distribution: Afghanistan, Pakistan and India (Himalaya).

As is already remarked by STACH 1960, the structure of labral margin is important for the diagnosis of *Drepanosira*. It is also important for the allied genus *Willowsia* SHOEBOOTHAM 1917.

#### 9. *Pseudosinella inaequalis* STACH (Fig. 5 A)

STACH 1960

6 expl. Taiwarra, Afghanistan, 3. IX 1955, T. UMESAO leg.

Body length ca. 1.2 mm. White. Head capsule is slightly dark, but other parts are pale. Prelabral setae 2+2, plumose. Labral setae 5, 5, 4. Smooth distal area is median intruded to the granulated area in a rounded form. Labral margin has a pair of small papillae upon which a minute seta is located. Inner side of labral

margin with 1+1 oblique trabeculae. Maxillar head reduced. Other characters as in the description of STACH (1960).

Distribution: Endemic to Afghanistan.

As the labral structure of both *Lepidocyrtus* and *Pseudosinella* is not yet systematically studied, no sure conclusion can be drawn about the specific difference between *Lepidocyrtus octopunctatus*, *Pseudosinella octoculata* and *Pseudosinella inaequalis*. Here some notes on labral structure of the genus are to be given. Prelabral setae are usually feathered in *Lepidocyrtus* (s. str.) and *Acrocrytus* nom. nov. (= *Discocyrtus* YOSII 1959, homonymous with an Opilion genus *Discocyrtus* HOLMBERG, 1878), while they are smooth in *Acrocrytus* YOSII (1959). In *Pseudosinella* both types are present.

*Pseudosinella petterseni* BÖRNER 1901 (Fig. 5 B) (Madrid, Spain, R. YOSII leg.) has 2+2 prelabral setae smooth. Labral setae 5, 5, 4, the lateral setae of the second row proximally dislocated and smaller than others. Labral margin without paillae. Median intrusion of the border of distal smooth area rounded.

*Pseudosinella alba* (PACKARD 1873) (Fig. 5 C) (Liège, Belgium, F. CARPENTER leg.) has short but distinctly feathered prelabral setae. Labral setae 5, 5, 4, the lateral setae of the second row a little shorter than others and not dislocated proximally. Median intrusion of the border of distal smooth area acutely projecting.

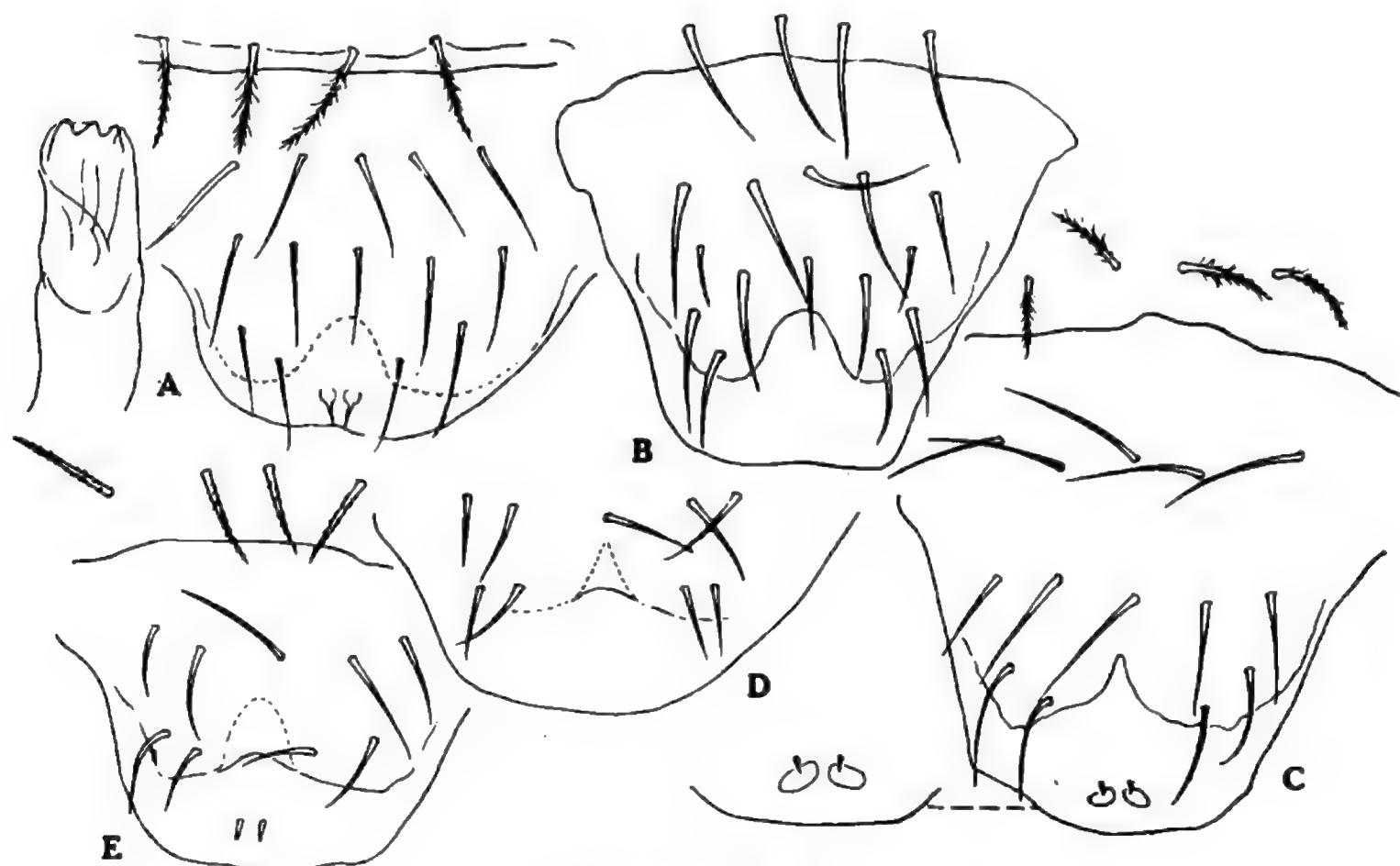


Fig. 5. Labral structure of *Pseudosinella* spp.

A: *Pseudosinella inaequalis* STACH (Labrum and maxilla)

B: *Pseudosinella petterseni* BÖRNER from Spain

C: *Pseudosinella alba* (PACKARD) from Belgium

D: *Pseudosinella violenta* (FOLSOM) from U.S.A.

E: *Pseudosinella sexoculata* (SCHÖTT) from U.S.A.

Labral margin with 1+1 distinct papillae accompanied by 1+1 minute spines proximal to them in position.

**Pseudosinella violenta** (FOLSOM 1924) (Fig. 5 D) (Lejoune, U. S. A. D. L. WRAY leg.) The species is very near *P. petterseni* CB., but may be easily separated by the labral structure. Prelabral setae are 2+2, plumose. Labral setae 5, 5, 4. Lateral setae of the second row not smaller than others. Two setae of the third row are standing side by side. Median intrusion of the border of distal smooth area is acute and a transverse furrow (?) is to be seen directly before it. No marginal papillae.

**Pseudosinella sexoculata** (SCHÖTT 1902) (Fig. 5 E) (Idaho, U. S. A., D. L. WRAY leg.). This species is characterised by 3+3 eyes in two groups. Prelabral setae are 2+2, very slightly serrated. Labral setae 5, 5, 4 as usual. Median intrusion of the smooth area is rounded in shape. A faint concave furrow is to be seen before it. Labral margin has a pair of small hooks, but no basal papillae are to be found. A pair of trabeculae of the inner side is not conspicuous.

#### 10. *Cyphoderus zoroastris* sp. n. (Fig. 6)

3 exple. Handis, Swat, W. Pakistan, 6. X 1956, K. YOSHIBA leg.

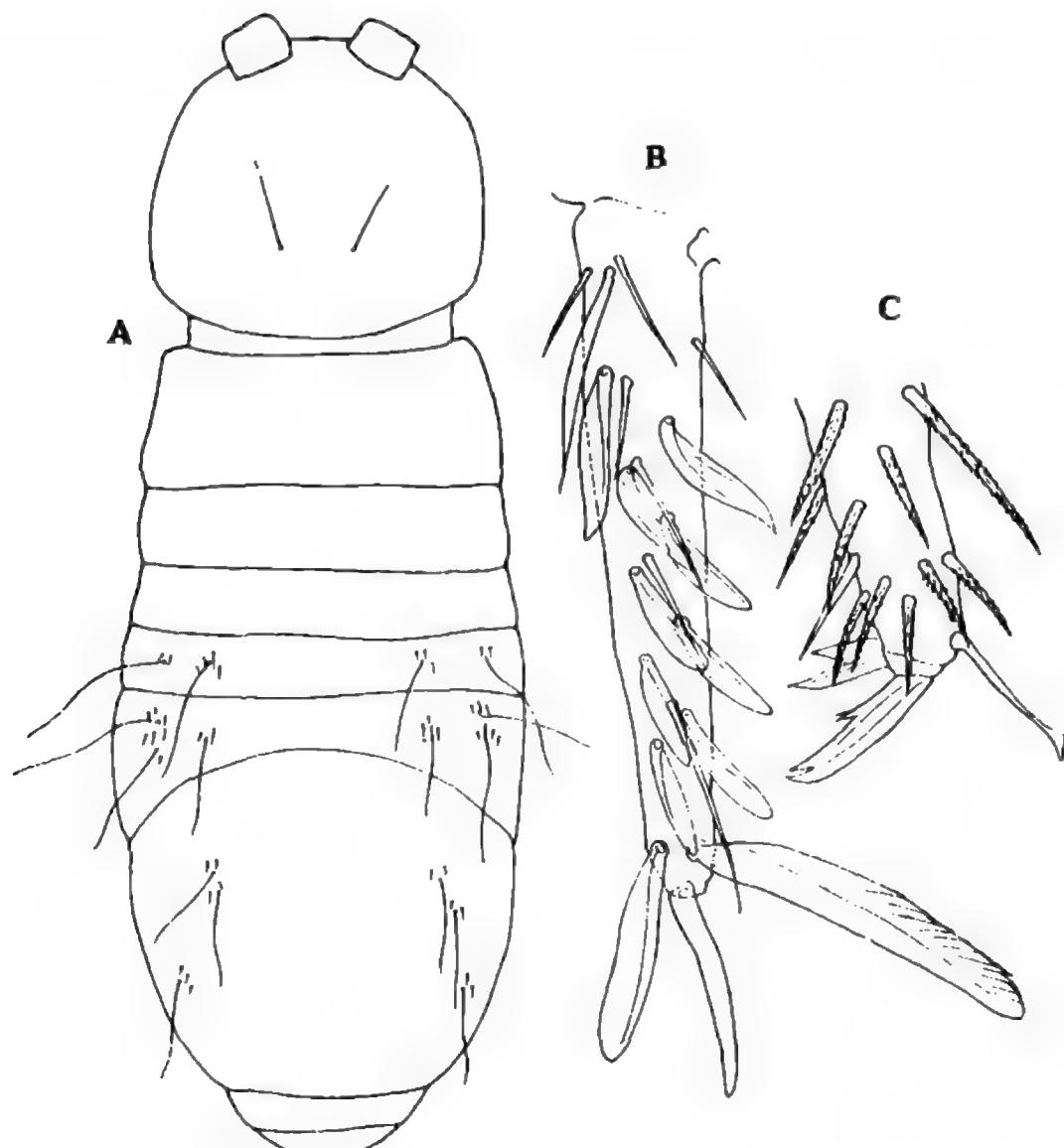


Fig. 6. *Cyphoderus zoroastris* sp. n.

A: Dorsal view of body; B: Dentes and mucro (dorsal);  
C: Hind claw.

5 expls. from ant's nest in Gartri, Swat, W. Pakistan, 8. X 1956, K. YOSHIBA leg.

Body length 0.8 mm. Colour white. Ant. / head as 13 : 10. Ant. ratio as 4 : 10 : 6 : 13. Ant. IV spindle-shaped, distally without end-bulb, but with many curving sensory setae. Ant. III rounded, two obscure, short sensory setae represent perhaps the ant. III-organ. Ant. I and II scaled. Eyes absent. Dorsal side of the head densely scaled, with 1+1 long sensory setae. Unguis without lateral teeth, with a pair of inner basal and one large inner distal teeth, of which the latter is located near the apex. Unguiculus lanceolate, with one prominent outer tooth. Tenent hair as long as unguis and distally dilated. All tibiotarsus not scaled. Mesonotum not hanging over the head. Rami tenaculi tridentate, corpus with one median seta. Furcula well developed. Manubrium is ventrally only with scales and dorsally only setaceous. Dentes distally converging. Feathered setae are arranged as outer 6, inner 5, all of them subequal in length except a pair of distal ones, which are considerably longer than others. The inner distal one is the longest and surpassing the mucro. Four dorsal setae and one inner proximal seta present. Beside these there is a basal group of 3 setae, one of which is converted into long scaly form. Ventral side is densely scaled and distal scales are very long, surpassing the mucro. Mucro is straight, distally plump and without teeth nor lamellae. Body surface only with rounded scales, all setae being small and unmodified. Setae sensuales are filiform, 2, 3, 3 upon abd. II-IV and accompanied by 3-4 small accessory setae. In the following table, relative lengths of furcal appendages are given :

	Manubrium	Dens	Mucro	A-1	I-1
A	50	35	11	—	—
B	60	50	13	—	—
C	60	35	12	10	18
D	45	32	9	9	—
E	45	32	10	9	—
F	42	28	8	6	15
G	45	30	8	8	16
H	65	45	14	13	24

The species is near BÖRNER's *C. heymonsi* from Transkaspia (Benkoran), but different in having a large inner distal tooth of unguis as well as in the number of feathered dental setae. It is more nearly related to *C. limboxiphius* BÖRNER (1913) of Africa, but this species seems to be not yet well investigated. Considerable differences exist between BÖRNER's description from Natal and the forms described by DENIS 1935 (Mozambique), DELAMARE-DEBOUTTEVILLE 1945 (East Africa) and WOMERSLEY 1929 (Rhodesia). Probably *C. zoroastris* and *C. heymonsi* are Asiatic representatives of this group.

#### 11. *Sphaeridia* cf. *pumilis* KRAUSBAUER (Fig. 7)

STACH 1956, JEANNENOT 1957

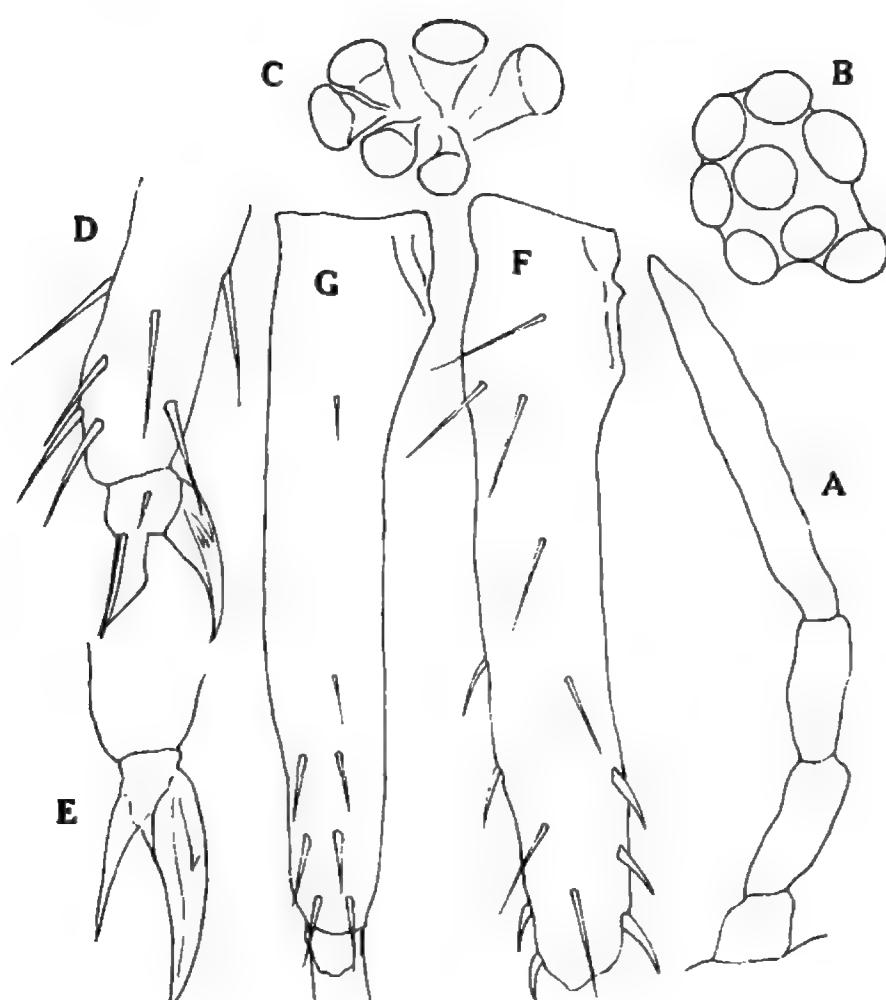
1♀, Taiwarra, Afghanistan, 13. IX 1955, T. UMESAO leg.

Body length 0.4 mm. Colour brownish gray. Antennae and dorsal side deeply pigmented. Trunk finely granulated and with paler segmental margins. Legs and furcula pale. Ant. / head as 10 : 13. Ant. ratio as 10 : 20 : 22 : 55. Ant. IV not subsegmented. Eye cornea 8+8, but eye pigments as 6+6. Unguis with a pair of lateral teeth, which is sometimes pseudonychia-like. Inner tooth absent. Tibiotarsal setae not modified. Unguiculus is elongate, slightly shorter than unguis in fore-legs, while it is broad and distally truncate on other legs. Tenent hair absent. Furcula in ratio as 1 : 2 : 1. Dentes with the following chaetal arrangement:

outer :	1, 1, 1, 1 .....
dorsal:	1, 1, 1, 1, 2-3
inner :	1, 1, 1 ... 1 ...
ventral:	2, 2, 2, 1 ..... 1 .....

From these setae outer 1, 2 and inner 1, 2, 3 are converted to short curving spines. Mucro is rounded apically, serrated on both sides and with a slight notch ventrally at about the middle.

The species is, without doubt, near *Sphaeridia pumilis* of Europe, but different in having no axial setae of unguiculus surpassing it and by another arrangement of dental setae, some of which are converted into spines.



**Fig. 7. *Sphaeridia pumilis* (KRAUSBAUER)**

A: Antenna; B: Pigment of eye-field;  
C: Cornea of eye-field; D: Hind claw; E: Fore claw;  
F, G: Dentes (dorsal and ventral view).

12. *Bourletiella arvalis* (FITCH)

DENIS 1936, STACH 1956

5♀, 6♂, Gilgit, W. Pakistan, 2. IX 1956, K. YOSHIBA leg.

The material coincides exactly with the description of previous authors. DENIS' material is also collected at Gilgit.

Distribution: Europe, North America and Pakistan.

13. *Sminthurinus aureus* (LUBBOCK) f. *ornata* KRAUSBAUER (Fig. 8)

STACH 1956

1♀, 1♂, Herat, Afghanistan, 22. IX 1955, T. UMESAO leg.

Body length 0.7 mm. Ground colour yellow, with blue black pattern of the

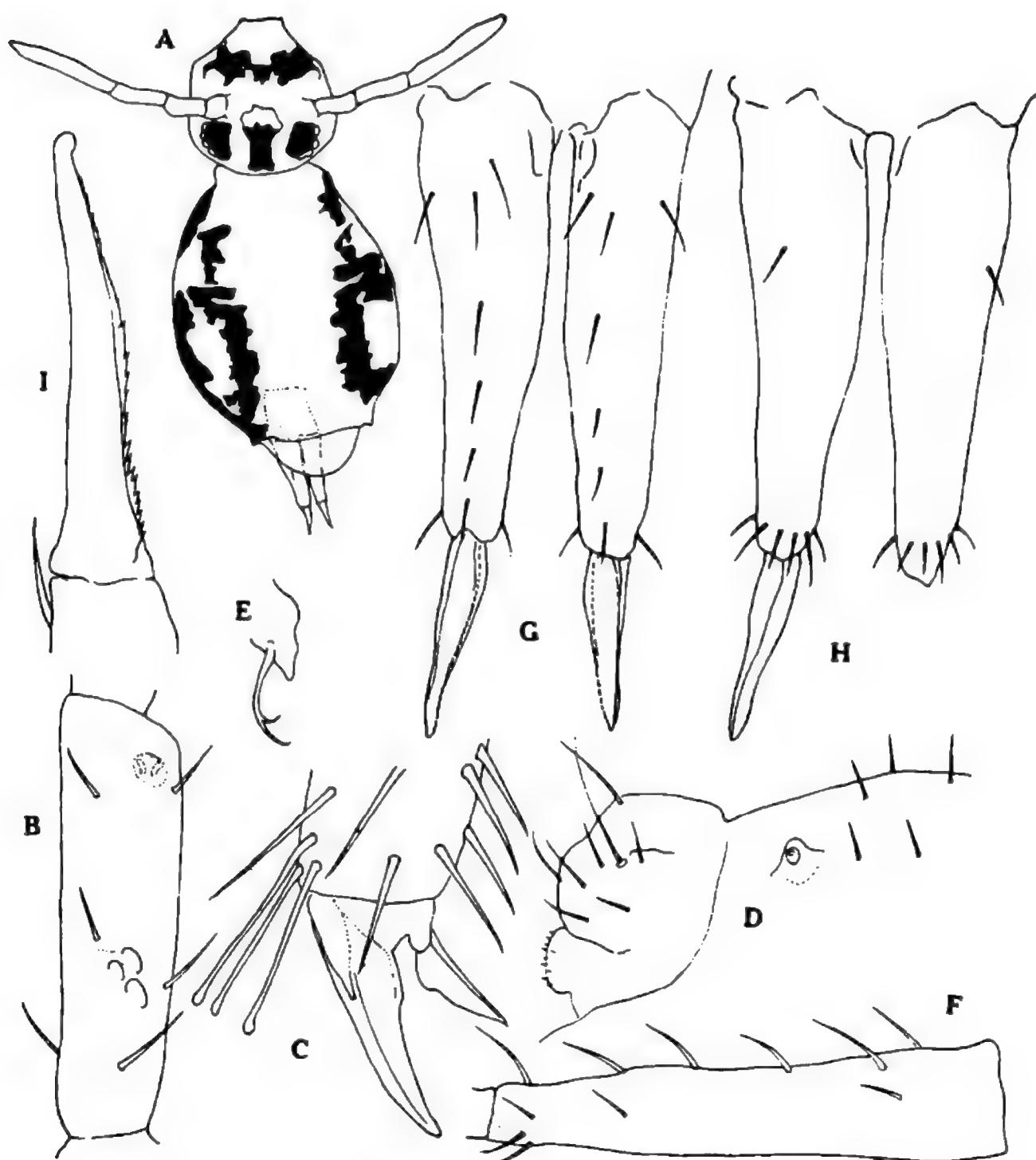


Fig. 8. *Sminthurinus aureus* f. *ornata* Krausbauer

A : Habitus ; B : Ant. III-organ ; C : Mid claw ; D : Anogenital segment (lateral view) ; E : Appendix analis ; F : Dentes (lateral view) ; G : Ditto (dorsal view) ; H : Ditto (ventral view) ; I : Mucro.

body. Antennae dark blue on distal half. Body pigment as in fig. A. Legs, furcula and anal segment pale. Ant. / head as 1.7. Ant. ratio as 10 : 17 : 24 : 50. Ant. IV not subsegmented. Ant. III-organ is two blunt rods near distal end. Tuberles of ant. III obscure, rounded and three in number by a single female, but absent by a male. Maxillae normal for the genus. Unguis with a pair of basal lateral teeth and without inner tooth. Unguiculus is longer upon fore-legs and not so upon others. Tibiotarsal tenent hairs 3, 3, 3 all distally swollen. Setae sensuales 3+3, they are located at a fixed place in relation to the body pattern. As abd. V is ankylosed with the proximal larger part of abdomen (*aureus* group of STACH), so there is an another pair of s. s. directly before the anal segment and this s. s. is provided with a prominent basal papillae. Anal setae of the female are alate and a median seta of them is bifurcated. Appendix analis is on a high basal papilla and bi- or trifurcate near the apex. Rami tenaculi tridentate, processus anteriores digitiform, high and with 1-2 setae. Processus posteriores low and without setae. Furca in ratio as 20 : 25 : 10. Manubrium ventrally without setae but with a median distal furrow. Dentes converging, with setae as:

outer:	1, 1.....	1
dorsal:	1, 1, 1, 1, 1	
inner:	1 .....	1
ventral:	3 .....	1

mu/ung. as 7/3. Mucro with finely serrated inner and smooth outer side. Mucronal pseudonychia obscurely present. Body setae are small on proximal half of the body, becoming longer posteriorly, where they are as long as the unguis.

The Afghanistan material coincides fairly well with STACH's description of the species. The main difference consists of the dental setae, but this difference may come from the interpretation of dorsal and inner row of dental setae.

\* \* \* \* \*

During my research of Afghanistan and other materials of Isotomid Collembola, I have come across to the fact that the generic conception of *Isotoma* and *Isotomurus* must be renewed.

The first step of the problem is the description of *Acanthisotoma* BONET 1942, which has some of the ventral manubrial setae changed to spines. This character is, however, not restricted to his genotypical species: *Isotoma spinicauda* BONET, but also to be observed in all species of the *Isotoma viridis* Group. As such spiny setae are quite absent in the majority of smaller "Isotoma", it is necessary to separate them. The name *Desoria* AGASSIZ (1841) must revive to accomodate those forms and *Acanthisotoma* becomes the junior synonym of *Isotoma* BOURLET (1839). The distinction between *Isotoma* (sens nov.) and *Desoria* (sens nov.) is not restricted to the spiny setae on the distal ventral part of manubrium. In the mouth parts all the species of *Isotoma* I have investigated, have two pairs of large papillae along the distal margin of labrum (fig. 9 C, 10 D), while in *Desoria*, as

well as in *Isotomurus*, two pairs of longitudinal ridges are to be seen (fig. 16 A, 19 B). Dorsal side of dentes are also different. In *Isotoma* (s. nov.) proximal dorsal portion of dentes is beset with 1-3 larger setae accompanied by many smaller ones (fig. 9 F, 11 G), while in *Desoria* (fig. 16 G, 17 F) only 1-2 dorsal setae are present. The genus *Isotomurus*, which is hitherto characterized by the presence of serrated *setae sensuales* (= *bothriothrix*) upon abd. II-IV and by the serration of larger setae of abd. V, VI, has the quite different feature of dentes (fig. 23 E, 24 G). Very numerous but minute setae are occupying almost 2/3 of the whole length of the dorsal side of dentes. Crenulation is not so strictly transverse as in *Isotoma* and *Desoria*, but more granulate in form, reminding us the dentes of *Agrenia* to which the genus is apparently nearly related.

Thus the results may be summarized as follows:

***Isotoma*** BOURLET 1839 (syn. *Acanthisotoma* BONET 1930)

Genotype: *Isotoma viridis* BOURLET 1839

***Desoria*** AGASSIZ 1841

Genotype: *Desoria saltans* NICOLET 1841

***Isotomurus*** BÖRNER 1903

Genotype: *Isotoma palustris* MÜLLER 1776

In the following pages some additional and complementary notes about some representatives of these genera are to be given.

***Isotoma*** BOURLET 1839

The most instructive and successful notes to systematize the genus *Isotoma* is implicitly given in BÖRNER (1909), when he has described two Japanese species: *Isotoma pinnata* and *I. gracilliseta*. The characters used are the form of setae along the inner and outer dorsal side of dentes. The same opinion is also given by STACH (1947) in his description of *I. turkestanica* STACH from Central Asia. In reviewing the following forms I have surely affirmed the right understanding of these authors. As a new character to be adopted, I appreciate the marginal thickening of the manubrium. It is a chitinous ledge of the ventral end of the segment provided with one or two spines on the interior side. Besides the ant. III-organ is also noted.

- A Marginal manubrial thickening multispinose ..... *I. carpenteri* BÖRNER
- AA Marginal manubrial thickening bispinose ..... *I. anglicana* LUBB.
- AAA Manubrial marginal thickening with one spine
- B Ant. III-organ with more than 4 accessory sensory setae ..... *I. decorata* BROWN.
- BB Ant. III-organ with less than 2 accessory sensory setae
- C Unguis without inner tooth ..... *I. innominata* B.
- CC Unguis with two inner teeth

- D Ventral median setae of manubrium thick and striated ..... *I. pinnata* BÖRNER.
- DD Ventral median setae of manubrium thick but smooth  
E Distal median setae dorsally on manubrium feathered ..... *I. virgata* sp. n.
- EE Distal median setae dorsally on manubrium smooth ..... *I. innominata* A.

***Isotoma anglicana* LUBBOCK (Fig. 9)**

*I. anglicana*: LUBBOCK 1873

Syn.? *Isotoma viridis* var. *violacea*: LIE PETTERSEN 1898, STACH 1947

*Isotoma viridis* f. *coerulea* BÖRNER 1901

2 expl. London, England, P. N. LAWRENCE leg.

20 expl. Kent, England, P. N. LAWRENCE leg.

Body length up to 3.4 mm. Colouration violet gray. Examples from London is more deeply gray than Kent specimens. Antennae reddish gray. Extremities are pale. Ant. IV with a subapical conical process bearing two minute and unequal setae. Ant. III-organ composed of 2 blunt, curving rods inclined to one side and independent to each. An additional small sensory seta is present near by. Labral margin with 2+2 papillae, the inner pair smaller than others. Postantennal organ elliptical, about 2/3 the diameter of an eye. Unguis typical, having a pair of lateral and two inner teeth. Unguiculus with a prominent inner tooth. Ventral tube anteriorly with numerous setae. Posterior face has a pair of distal setae larger than others. Rami tenaculi quadridentate, corpus with about 42 setae. Manubrium ventro-distally with some 8 spiny setae. They are relatively thicker than in other species of *Isotoma*. Dorsal proximal part of dentes with many setae including three larger ones. Dorsolateral setae in 2-3 rows, inner lateral setae are very faintly ciliated that it is impossible to represent in figures. Outer setae smooth. Distal marginal thickening of manubrium is brownish and with two subequal spiny process in all examples examined. Male genital opening is surrounded by a ring having many short setae. Central cone is provided with 3+3 setae, of which the dorsal pair is smaller than others. All body setae are brown in colour, smaller ones are smooth, while larger ones are very long and feathered to all sides.

The species is probably to be separated from *Isotoma viridis* BOURLET, which has a dorsal median stripe of the trunk. As both *I. violacea* and *I. coerulea* are preoccupied, I propose to name this *I. anglicana* LUBBOCK, whose body colour given in LUBBOCK (1873) is about the same with the present examples. It is characterized by two spines of marginal thickening of manubrium.



Fig. 9. *Isotoma anglicana* LUBBOCK

A: End of ant. IV; B: Ant. III-organ; C: Labral margin; D: Postantennal organ  
 E: Posterior face of ventral tube; F: Dorsal view of dentes (proximal part);  
 G: Ventral view of manubrium (distal part); H, I: Marginal thickening and spiny setae;  
 of manubrium; J: Male genital area.

A, B, D, G, I, E: example from London; C, E, F, H: example from Kent.

#### *Isotoma innominata* A (Fig. 10)

1♀, Liege, Belgium, F. CARPENTIER leg.

Body length 2.5 mm. Colouration uniformly gray, but posterior abdominal segments are darker. Antennae also obscurely dark. Legs and furcula paler. Ant./head as 1.8. Ant. ratio as 7 : 14 : 16 : 16. Ant. IV distally with a conical process having one small seta on it. Ant. III-organ is two erecting free rods accompanied by one smaller sensory seta. Labral margin with 2+2 tubercles, the exterior ones larger than the interior pair. Postantennal organ is oval, about 2/3 of eye in diameter and its margin is crenulated (artifact? but distinctly so on both sides). Unguis stout, with one pair of lateral and two inner teeth. Inner side of the unguis

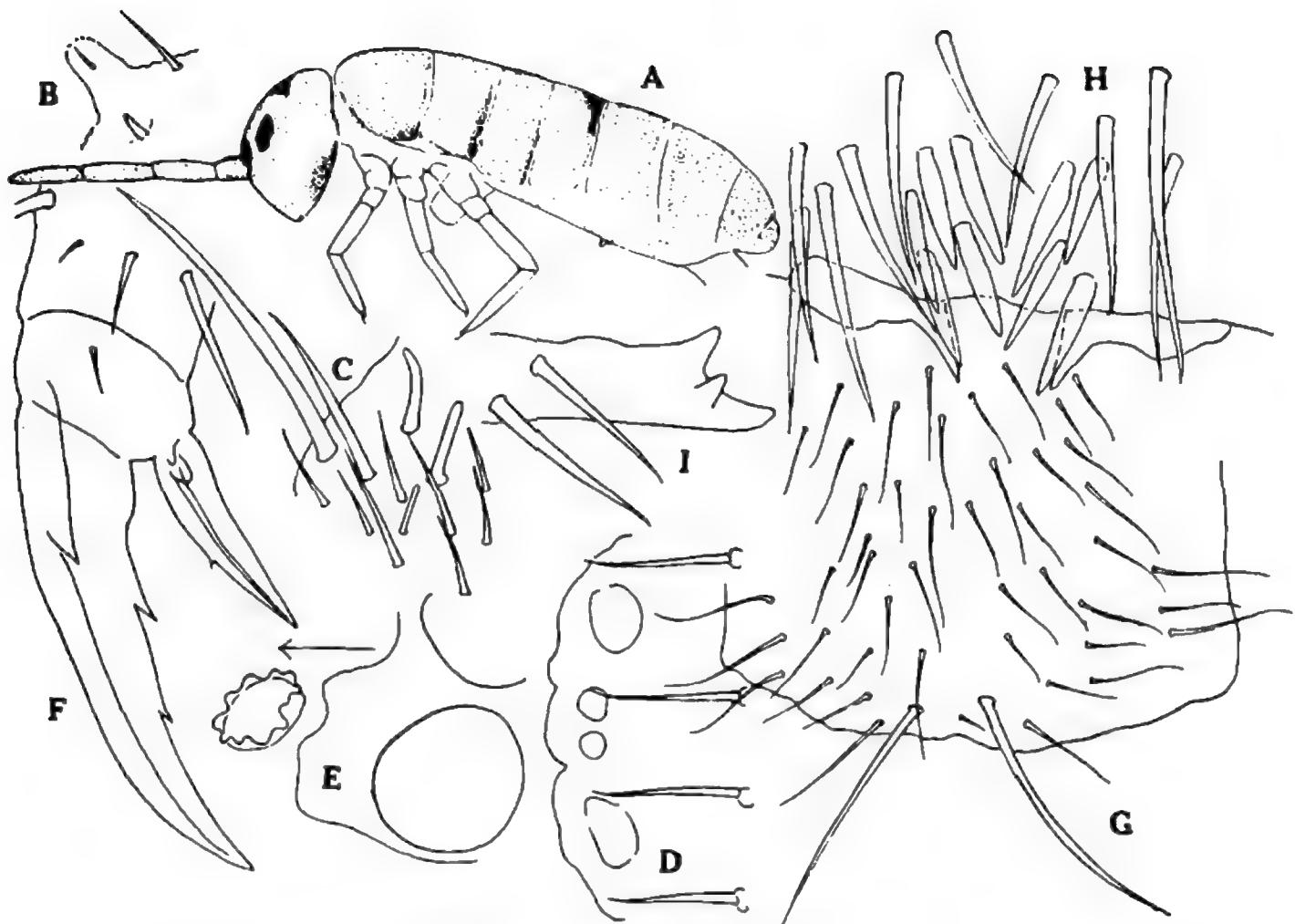


Fig. 10. *Isotoma innominata* A

A: Habitus; B: End of ant. IV; C: Ant. III-organ; D: Labral margin;  
E: Postantennal organ; F: Hind claw; G: Posterior face of ventral tube;  
H: Spiny setae and marginal thickening of manubrium; I: Mucro

is transversely striated. Unguiculus lanceolate, pointed on apex and the inner tooth is very small compared with *I. anglicana*. Ventral tube anteriorly hirsute with many equal setae. Posterior face also hirsute and terminal 1+1 are considerably larger than others. Rami tenaculi quadridentate, corpus with ca. 40 large and small setae. Furcula in ratio as 4/9. Manubrium dorsally and laterally hirsute with many smooth setae, median distal ones are faintly ciliated. Ventrally setae are in triangular area, median distal setae are turned to spiny setae. Distal thickening of dental end is yellow, with one spiny tooth on inner side. Dentes ventrally hirsute, with short setae. Dorso-lateral setae are longer, inner ones are minutely serrated, while outer ones are faintly ciliated. Dorsal side proximally with many small setae including 2-3 larger ones. Mucro typically tricuspidate. Body setae light brown, smooth. Larger body setae very long and distally feathered to all sides.

The species differs from *Isotoma anglicana* LUBB. in having manubrial thickening unidentate and dorsolateral setae of dentes more feathered. Manubrial spiny setae are thinner than in the cited species.

#### *Isotoma virgata* sp. n. (Fig. 11)

6 expl. Nagata, Yakushima, Japan, 26. X 1955, R. YOSII leg.

Body length up to 4.0 mm. Ground colour yellowish white, heavy black pigments adorn the body as in fig. 11. Antennae with a longitudinal streak dorsally

along the inner side. Head pigmented upon antennal basis and with a small vertical spot. Th. II, III with narrow lateral streak. Coxal basis black. Th. III to abd. III each broadly banded, leaving narrow segmental margins uncoloured. Abd. IV-VI almost free of pigments except in one example by which all these segments are banded in the same way. Legs, furcula and ventral side pale. Ant. IV distally with a furcated conical process and an apical pit with a small knob in it. Ant. III-organ is two curving rods incerted freely, accompanied by two sensory setae, one directly behind them and another dorsally a little apart from them. Postantennal organ is oblong, about  $\frac{2}{3}$  of an eye in diameter and its margin is rather high. Labral margin with  $2+2$  unequal papillae, they are rather nearer to the margin than in *I. anglicana*. Eyes  $8+8$ , subequal and in a black eye-patch. Unguis normal for the genus, unguiculus is acute and with a conspicuous spinous inner tooth. Ventral tube anteriorly hirsute, with equal setae. Posterior face has  $1+1$  terminal setae larger than others. Tenaculum quadridentate, corpus with ca, 25 strong setae and, therefore, fewer than in other forms of the genus. Furcula with man:d as 1:2.

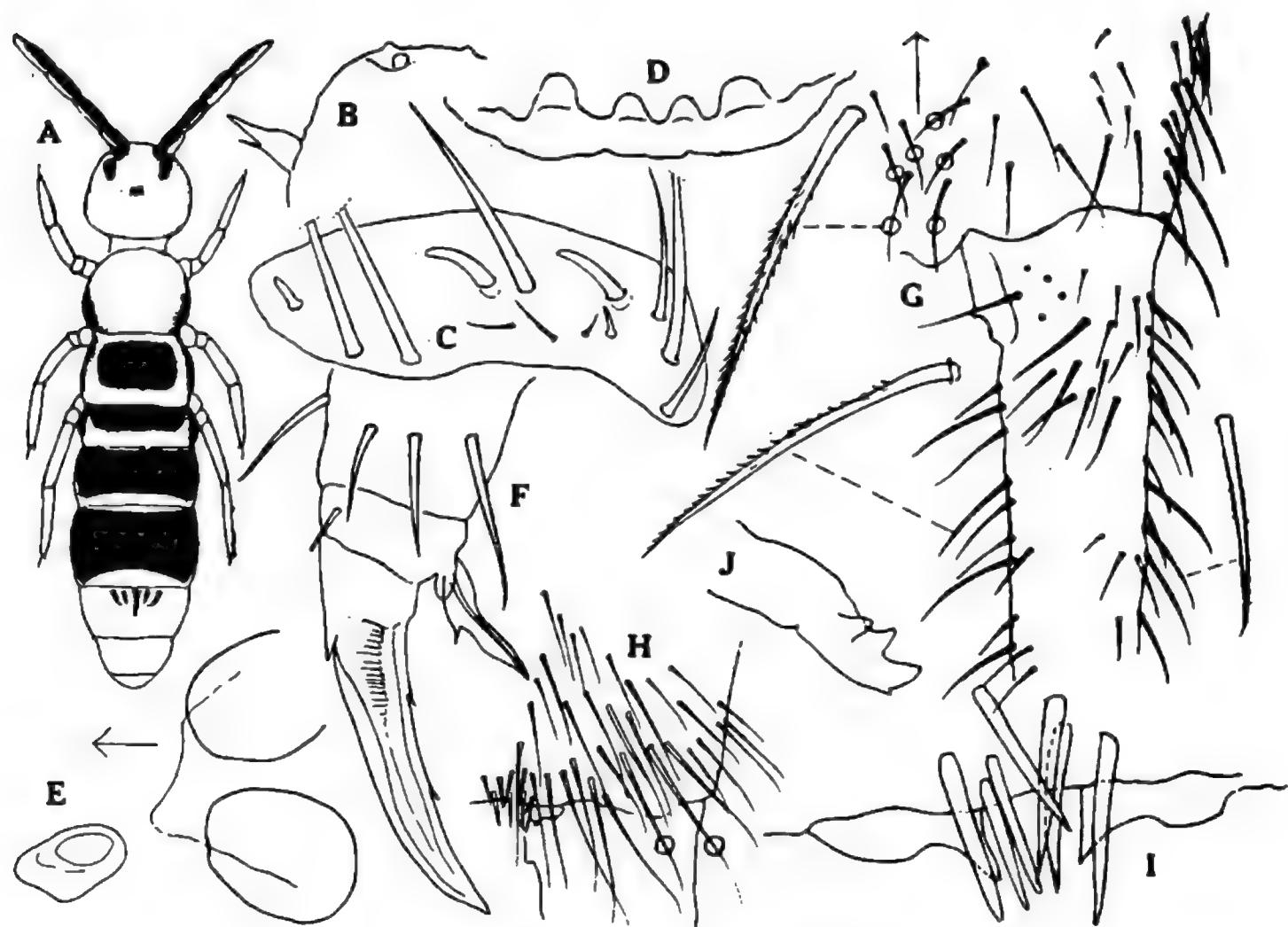


Fig. 11. *Isotoma virgata* sp. n.

A: Habitus; B: End of ant. IV; C: Ant. III-organ; D: Labral margin; E: Postantennal organ; F: Fore claw; G: Dorsal view of manubrium (distal part); H: Ventral view of manubrium (distal part); I: Marginal thickening and spiny setae of manubrium; J: Mucro.

(Setae with a round spot in fig. G, H indicate the serrated ones)

Manubrium is dorsally with many setae equally dispersed, 3+3 from near the distal median part are slightly ciliated, while others are smooth. Ventral side has a triangular hirsute area, distal median setae are modified, short and robust, but not so spiny as in other species. All ventral setae are smooth with the exception of some 2-3 on each side near the distal outer margin of the manubrium. Marginal thickening is castaneous, with one spine on interior part. Dentes ventrally with many smooth, short setae. Dorsal side is proximally with some large and small setae. Dorsolateral setae in 2-3 rows, inner ones are extremely serrated, while outer ones are feebly serrated. Mucro quadridentate, having always an additional small ventral tooth. The third tooth is located laterally. Body setae are castaneous brown, usual setae are smooth, while larger ones are strongly feathered to all sides.

The present form is perhaps a colour variety of *I. pinnata* f. *fasciata* BÖRNER 1909. But as *I. fasciata* is already used by CARPENTER (1912), the BÖRNER's name is better to be neglected. For the characteristics of the species see the key of the genus.

### *Isotoma decorata* BROWN (Fig. 12)

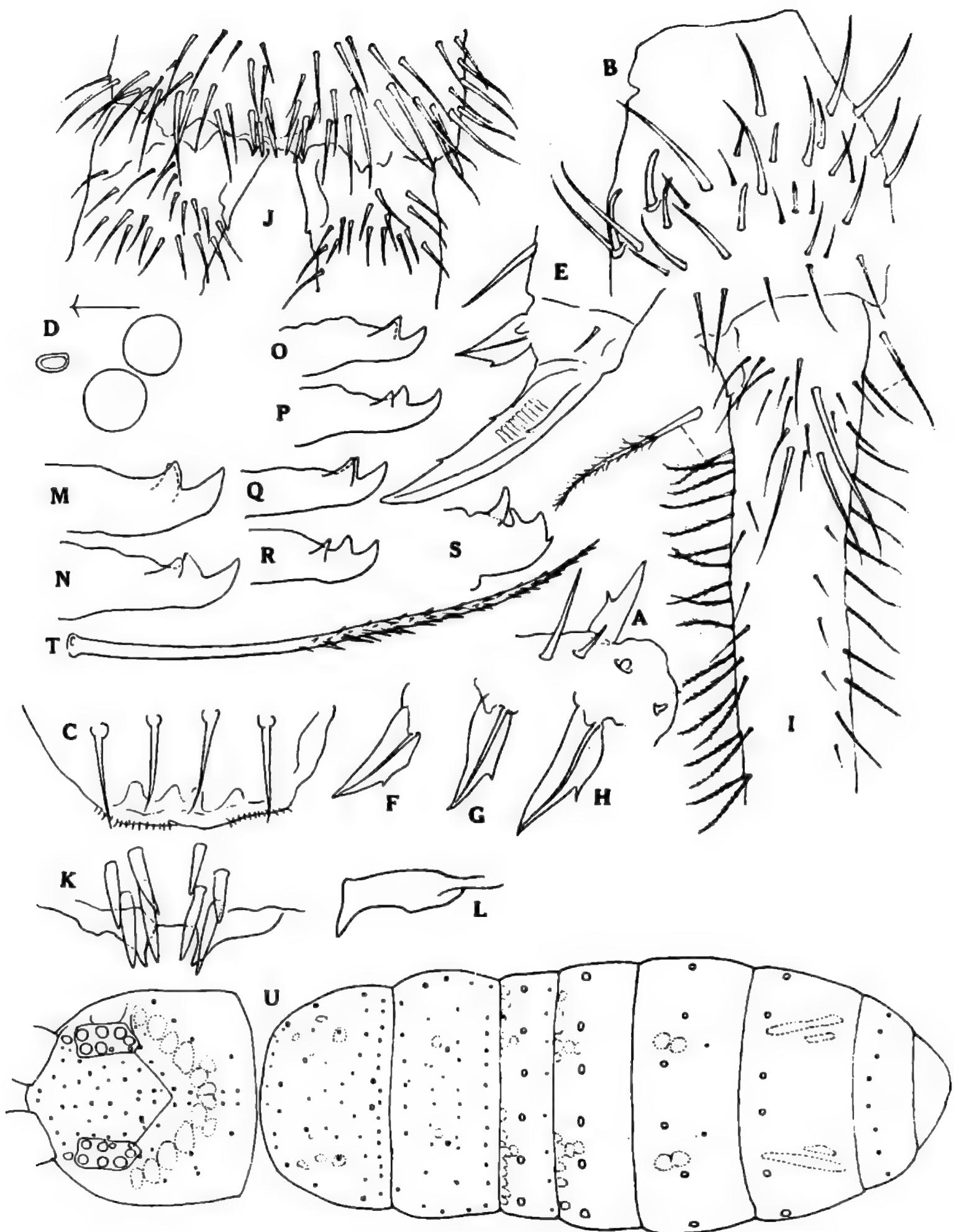
*Isotoma viridis* var. *decorata*: BROWN 1926, HANDSCHIN 1942, STACH 1947

*Isotoma spinicauda*: BONET 1930, HANDSCHIN 1960, STACH 1960

*Acanthisotoma spinicauda*: BONET 1942

20 expl. Herat, Afghanistan, 22. IX 1955, T. UMESAO leg.

Body length up to 2.5 mm. Colouration is as described by HANDSCHIN (1960) upon Palestine examples. Ant. IV distally with a conical process, which has a small branch at the middle. Ant. III-organ is two sensory rods incerted freely near the distal margin. They are accompanied by more than 4 blunt sensory setae, thus contrasting from usual species of *Isotoma*. Labral margin with 2+2 rounded papillae, the inner pair smaller than outer ones. Postantennal organ elliptical, smaller than 1/2 of eye in diameter. Unguis normal, with a pair of lateral and two inner teeth. Inner side is stridulated. Unguiculus is rather broad, with one acute inner process. Ventral tube as in others. Rami tenaculi quadridentate, corpus with more than 40 setae. Manubrium is dorsally setose, 1+1 median distal setae are clearly feathered. Ventral setae are in triangular area, median distal setae are converted to spiny setae. Distal marginal thickening of manubrial end is brownish and with one interior spine. Dentes dorso-proximally with 3 larger and some smaller setae. Dorso-lateral setae are in 2-3 rows and those of inner side are markedly feathered as in *I. innominata* A, while those of outer side are ciliated. Mucro variable in form, a small ventral tooth is rarely present (fig. S), apical tooth elongate or not, two other teeth are subequal and often standing side by side, but usually the third one posterior to the second one. Body setae heterochaetotic, arrangement as in fig. U. All usual setae are smooth, while larger ones are strongly brownish and intensely feathered.



*Fig. 12. Isotoma decorata BROWN*

A : End of ant. IV; B : Ant. III-organ; C : Labral margin; D : Postantennal organ; E : Fore claw; F, G, H : Unguiculus of fore-, mid- and hind leg; I : Dorsal view of dentes (proximal part); J : Ventral side of manubrium (distal part); K, L : Marginal thickening of manubrium; M-S : Various forms of mucro; T : Larger setae from abd. IV; U : Chaetal arrangement of the body.

Beside the body pattern, the species is characterized by the presence of some accessory sensory setae near ant. III-organ. In other respects it is near *I. innominata* A, but postantennal organ is smaller in this species. *Isotoma decorata* is first described by BROWN as a colour variety of *I. viridis*. Later it is reported by HANDSCHIN from Palestine. BONET's *I. spinicauda* and STACH's *I. turkestanica* seems to be identical with it, as they coincide fairly well with respect to body pattern, spinous setae of manubrium and feathered setae of dentes. Thus *I. decorata* is widely distributed throughout Palestine, Iraq, Afghanistan, West Pakistan (Waziristan) and Turkestan (Tashkent).

### *Isotoma innominata* B (Fig. 13)

6 expl. Naltar Pass (5,000 m. alt.) NW District, Pakistan, under stones of the snow clad glacier, 13. IX 1957, K. YOSHIBA leg.

Body length 2.5 mm. Colouration uniformly black, antennae reddish violet. Head mottled on posterior half. Coxa, trochanter of all legs, ventral tube and manubrium dark. Ant. / head as 2 : 1. Ant. ratio as 9 : 14 : 14 : 19. All antennal setae short. Ant. III-organ is composed of 2 isolated rods. Eyes 8+8, G and H

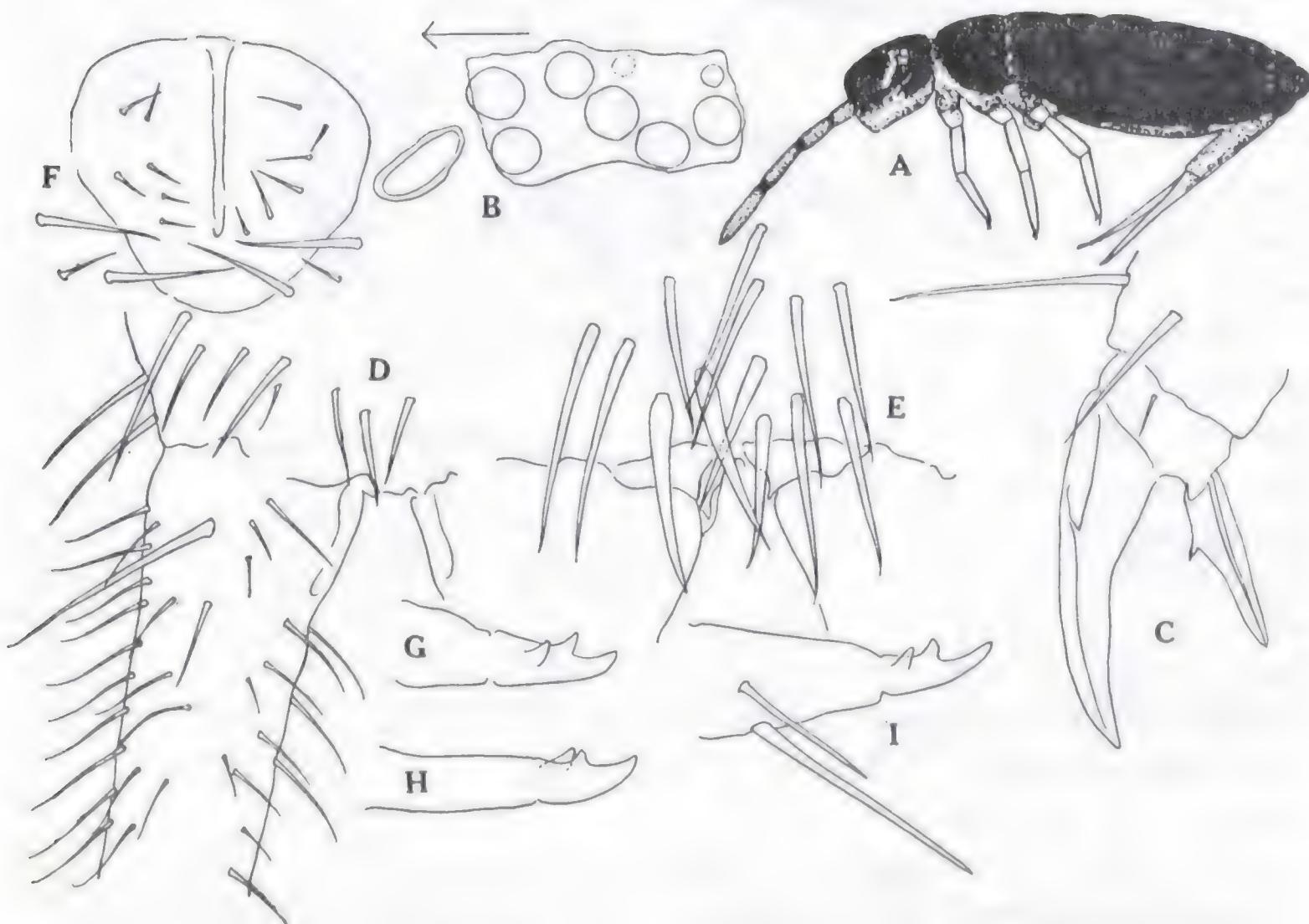


Fig. 13. *Isotoma innominata* B

A : Habitus ; B : Postantennal organ and eyes ; C : Hind claw ;  
D : Dorsal view of dentes (proximal part) ; E : Ventral view of  
manubrium ; F : Male genital area ; G, H, I : Mucro.

are smaller and with weaker cornea. Postantennal organ elliptical, 1.5 to 2.0 times the diameter of an eye. Unguis with a pair of lateral teeth, but without any inner tooth. Inner side of unguis without transverse striae. Unguiculus lancet-like, with one prominent inner tooth. One setaceous tibiotarsal tenent hair to each legs. Ventral tube anteriorly with ca. 8+8 feeble setae. Posterior face has 1+1 larger terminal setae together with about 10 smaller ones. Man : d as 5 : 9. Manubrium is dorsally hirsute, with many smooth setae. Ventral side has a triangular hirsute area and distal median setae are more or less spiniform. All these setae are smooth. Marginal thickening is small, low and with one interior spine. Dentes dorsoproximally with 2 larger and some 4-5 smaller setae. All of them and the dorso-lateral setae are smooth. Mucro tridentate, apical tooth is elongate and not much curved. The other two subequal, the third is placed laterally. Genital orifice of male is a rounded area, with a median slit and some 6 pairs of spiny setae (juvenile?).

Compared with other *Isotoma* species the form has different shape of mucro, no inner tooth of unguis, etc. Body colour is intensely black and referable to *I. pinnata* v. *coracina* BÖRNER (1909) of Japan. From the genital orifice it seems as if the examples are not yet fully mature. So this apparently new species is not especially named.

### *Isotoma pinnata* BÖRNER (Fig. 14)

*Isotoma pinnata*: BÖRNER 1909 (pro parte)

3 expl. Kamurikiyama, Nagano Pref., Japan, 20. VI 1955, S. UÉNO leg.

Body length 4.0 mm. Ground colour stramineous yellow, violet-black patches are adorning the body as fig. 14. Antennae reddish gray, distal portion and inner dorsal side are darker, especially upon ant. I. Head with heavy pigments on median frontal spot. Antennal basis and a pair of lateral streaks through the eye-field brownish violet. Trunk with a longitudinal median stripe interrupted posteriorly and enlarged laterally near the anterior and posterior margin of each tergites. Both side of the median stripe have broad dorso-lateral stripes heavily mottled. Lateral margin of th. II-abd. III with narrow longitudinal bands. Coxal basis pigmented. Coxa dark on hind legs, but pale on other legs. Femur dark only upon hind legs. Tibiotarsus diffusely pigmented upon all legs. Labral margin with 2+2 unequal tubercles. Eyes 8+8, G and H are smaller and their cornea is not well chitinized. Postantennal organ very small, about half the diameter of an eye, oval in shape and its margin is somewhat crenulated. Unguis with a pair of lateral and two inner teeth, the proximal inner tooth is much more conspicuous than the distal one. Ungleucus rather long, lanceolate and with an inner tooth. Ventral tube usual for the genus. Rami tenaculi quadridentate, corpus with more than 45 setae of various length. Distal ones are longer and surpassing the rami. Furcula with man.: d. as 1 : 2. Manubrium is dorsally hirsute, some setae of distal lateral portion are ciliated. Median distal setae are converted into short, broad, spiny setae, whose surface is longitudinally striated. Marginal thickening is brownish, with one low inner

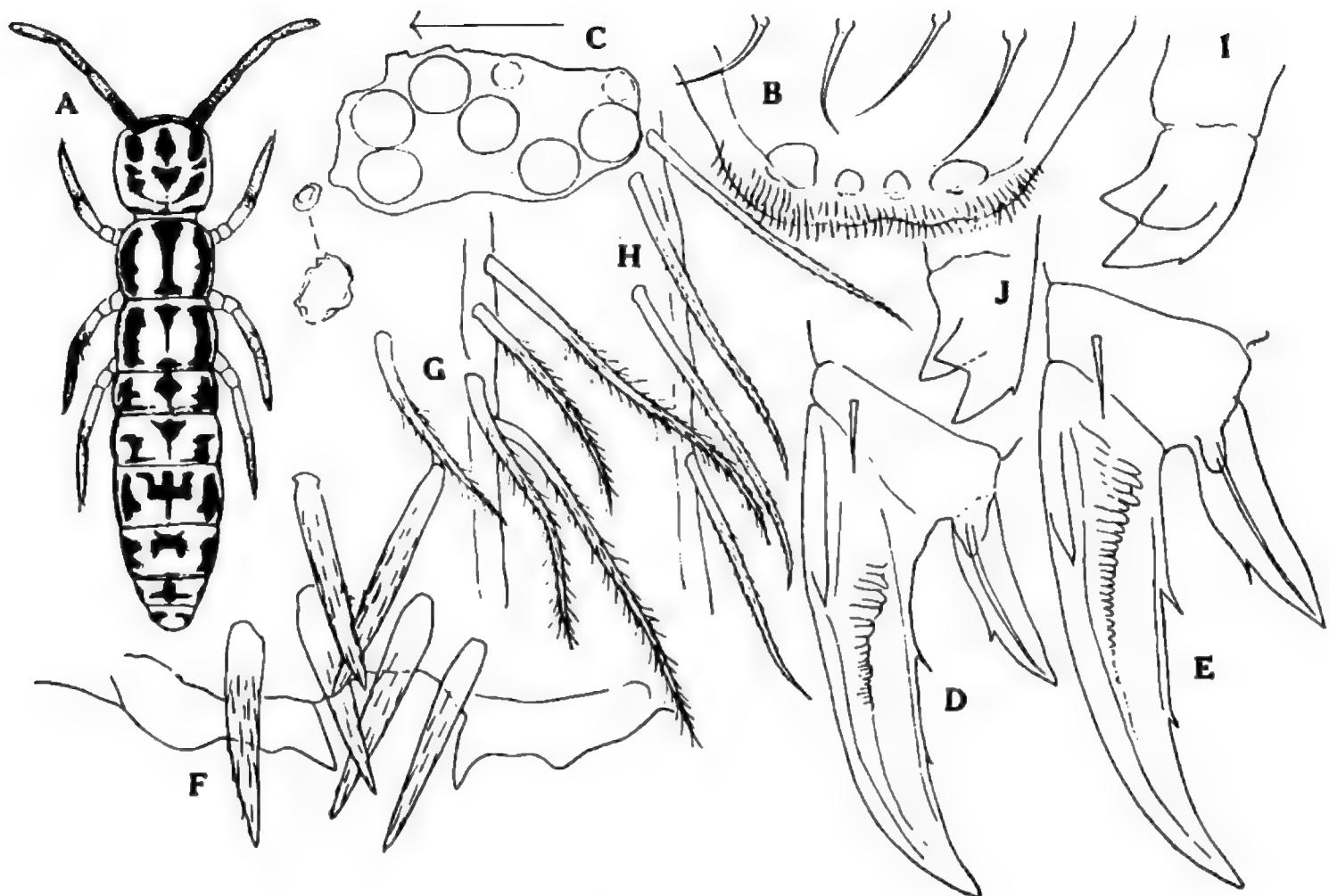


Fig. 14. *Isotoma pinnata* BÖRNER

A : Habitus; B : Labral margin; C : Eyes and postantennal organ; D, E : Fore- and hind claw; F : Marginal thickening and spiny setae of manubrium; G : Feathered setae of the inner dorsal row of dentes; H : Ditto of the outer dorsal row; I : Mucro.

spine. Dentes dorso-proximally with 2-3 larger and some shorter setae, all of which are smooth. Dorso-lateral setae in 2-3 rows. Inner lateral setae are extremely feathered and long, while outer lateral ones are minutely ciliated. Mucro quadridenate, having one minute ventral tooth. Body setae weakly brownish. Short setae are smooth, larger setae are intensely feathered on all sides. In contrast to other forms, body setae of intermittent length are pale and well ciliated.

The species seems to be, as was already pointed out by BÖRNER (1909), near *I. catena* GUTHRIE (1903) of Minnesota in mucro form, body colour, etc. From other species of *Isotoma* here described, it is to be distinguished by ciliated setae of manubrium, strongly feathered inner setae of dentes as well as by stronger inner proximal tooth of unguis.

#### *Isotoma carpenteri* BÖRNER (Fig. 15)

Syn.: *Isotoma carpenteri*: BÖRNER 1909, YOSII 1939

12 expl. Kyoto, Japan XI 1953 M. KAWANABE leg.

Body length up to 1.4 mm. Colouration yellowish white in alcohol, but purely white in living. Larger examples have black spots sprinkled all over the body. Ant. / head as 2 : 5. Ant. ratio as 15 : 23 : 25 : 33. Ant. IV subapically with a

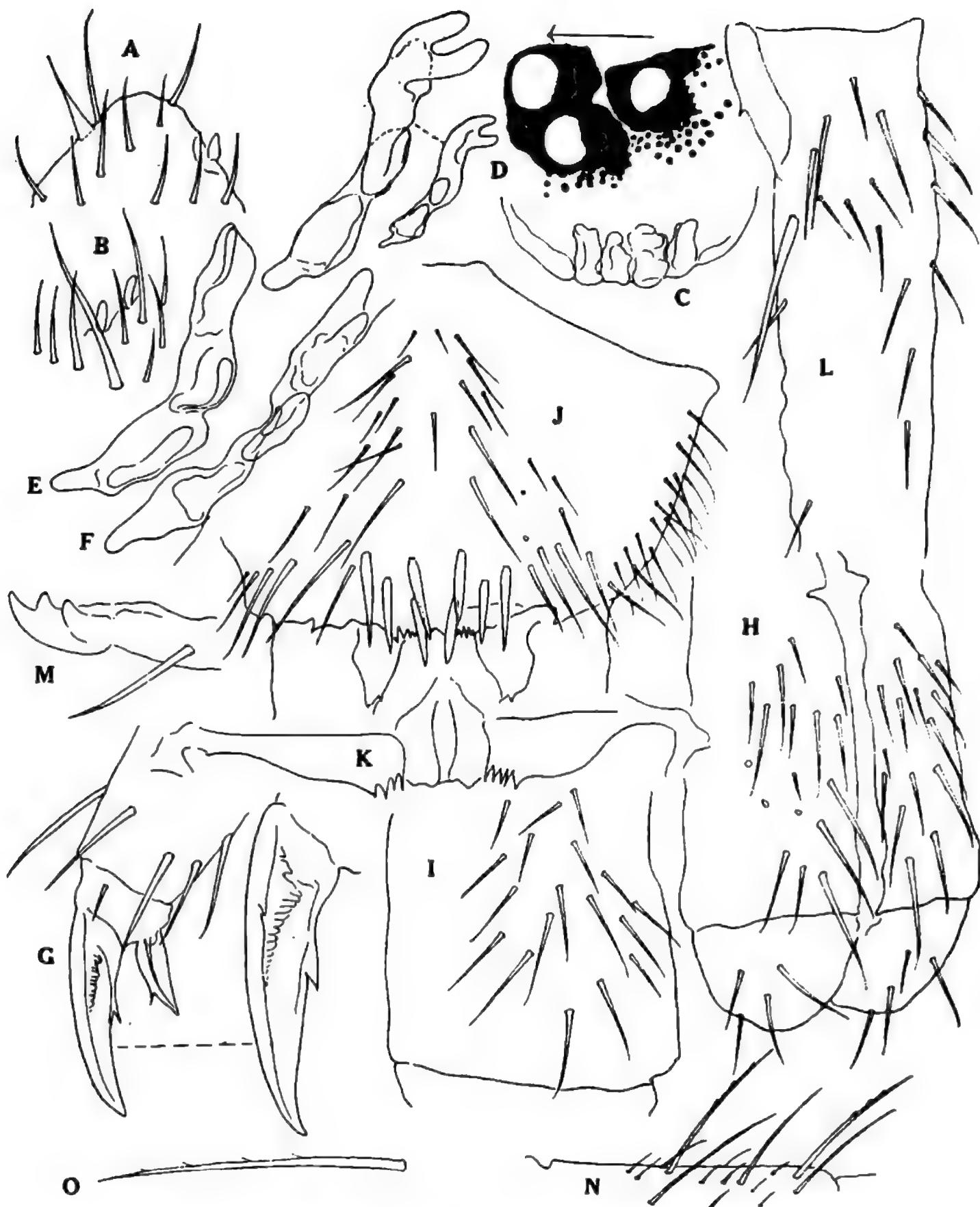


Fig. 15. *Isotoma carpenteri* BÖRNER

A : End of ant. IV; B : Ant. III-organ; C : Labral margin;  
 D : Eyes and postantennal organ; E : Postantennal organ  
 (another example); F : Ditto in lateral view; G : Fore claw;  
 H : Ventral tube (anterior face) I : Ditto (posterior face)  
 J : Manubrial setae (ventral face); K : Marginal thickening  
 of manubrium; L : Dentes (proximal dorsal view); M : Mucro  
 N : Setae of abd. III; O : One large seta of abd. III.

slender conical process ending in a seta and a small blunt rod in a groove. Ant. III-organ is a pair of blunt rods in a groove. No other sensory setae are to be found. Labral margin with 2+2 tubercles. Each tubercle is, however, not rounded as in other larger species, but irregularly longitudinal in disposition, thus showing the transient form to that of *Desoria*. Eyes 3+3, poorly pigmented and each eye is almost independently pigmented. Postantennal organ is extremely variable. In general, it is elongate and 2.5 times the length of an eye in diameter. The margin of the organ is well lamellated and these lamellae are coalescent at about the middle, so that two or three openings are to be found. Both ends of the organ are terminating in a blind, digitiform saccus and often forked into two pieces. Unguis uniformly carinate, with a pair of lateral teeth and one prominent inner tooth, the latter is situated at about the middle. Inner face of the unguis has minute transverse striae as in case of *Isotoma viridis*-group. Unguiculus broad, subequal in shape in all legs and with a prominent inner tooth. No tenent hairs are differentiated. Ventral tube anteriorly with ca. 15 pairs of equal setae. Posterior face has some 18 equal setae. Lateral flap has constantly 4 setae each. Rami tenaculi quadridentate, corpus with ca. 22 setae. Furcula in ratio as 25 : 90, the manubrium is, therefore, very short and strongly converging distally. Dorsal side of manubrium is uniformly hirsute with many setae. Ventral side has relatively fewer setae arranged in a triangle area and some 4 pairs of distal setae are converted to spines. Marginal thickening of manubrium is very striking, having many (more than 4) spiny processes on interior part. Dentes on dorsal proximal portion with some large and small setae. All lateral setae smooth. Ventral side with many short, stiff setae. Distal smooth portion is ca. 1.8 times the mucro in length. Mucro is tridentate, apical tooth elongated and lightly curving, anteaapical one upright; the third one is lateral and proximal in position. Body setae are smooth and pointed, some larger setae of abdominal segments with a small number of serration (2-3). Abd. III : IV as 1.0. Abd. V and VI are almost confluent, being separated dorsally by an insignificant transverse fold of integument.

This remarkable species of *Isotoma* has reduced number of eyes. It is almost equal to the brief description of *Isotoma carpenteri* BÖRNER (1909) in details. However, the number of eyes is different and not a single specimen with 5+5 eyes has yet been detected. Manubrial thickening and labral margin are also characteristic. Probably the species is an aberrant form among *Isotoma*, showing some degenerating or neotenic tendency.

#### ***Desoria* AGASSIZ 1841**

It is not the place to describe all the species-complex of *Desoria* widely distributed throughout the world. The following notes upon some of the representatives are only to show that the study of the labral structure and the chaetotaxy of the ventral tube is important for the taxonomy of *Desoria* to approve the intrageneric relations between each species. In resume there seems to exist two groups of

*Desoria*: the first group includes *D. yukanomi*, *D. (Pseudisotoma) sensibilis* and *D. (Vertagopus) cf. montana*. The second group is represented by *D. olivacea* which has no special structure upon labral margin. Further researches are needed.

***Desoria yukanomi* (YOSII) (Fig. 16)**

*Isotoma yukanomi*: YOSII 1940, 1961

Of this interesting snow inhabiting species of Japan nearly related to *Desoria saltans* NICOLET of Europe in body colouration and ecological habits, I have already described fairly in detail. Some additional notes are given from the paratypes and from the further collection from Mt. Tanigawa: Ant. III-organ has a shallow common groove, but two rods are incerted freely when fully extended. Labral setae 5, 5, 4 each upon papillae. Prelabral setae 2+2 without papillae. Labral margin with 2+2 short longitudinal ridges. Ventral tube anteriorly with ca. 6 pairs of weak setae, posterior side with 4 pairs of setae, distal ones larger than others. Lateral flap has some 10 setae each. Manubrium dorsally hirsute with fewer setae than in *Isotoma*, a terminal median pair are larger than others. Ventral side has a triangular hirsute area, all setae smooth. Marginal thickening is internally with a spine

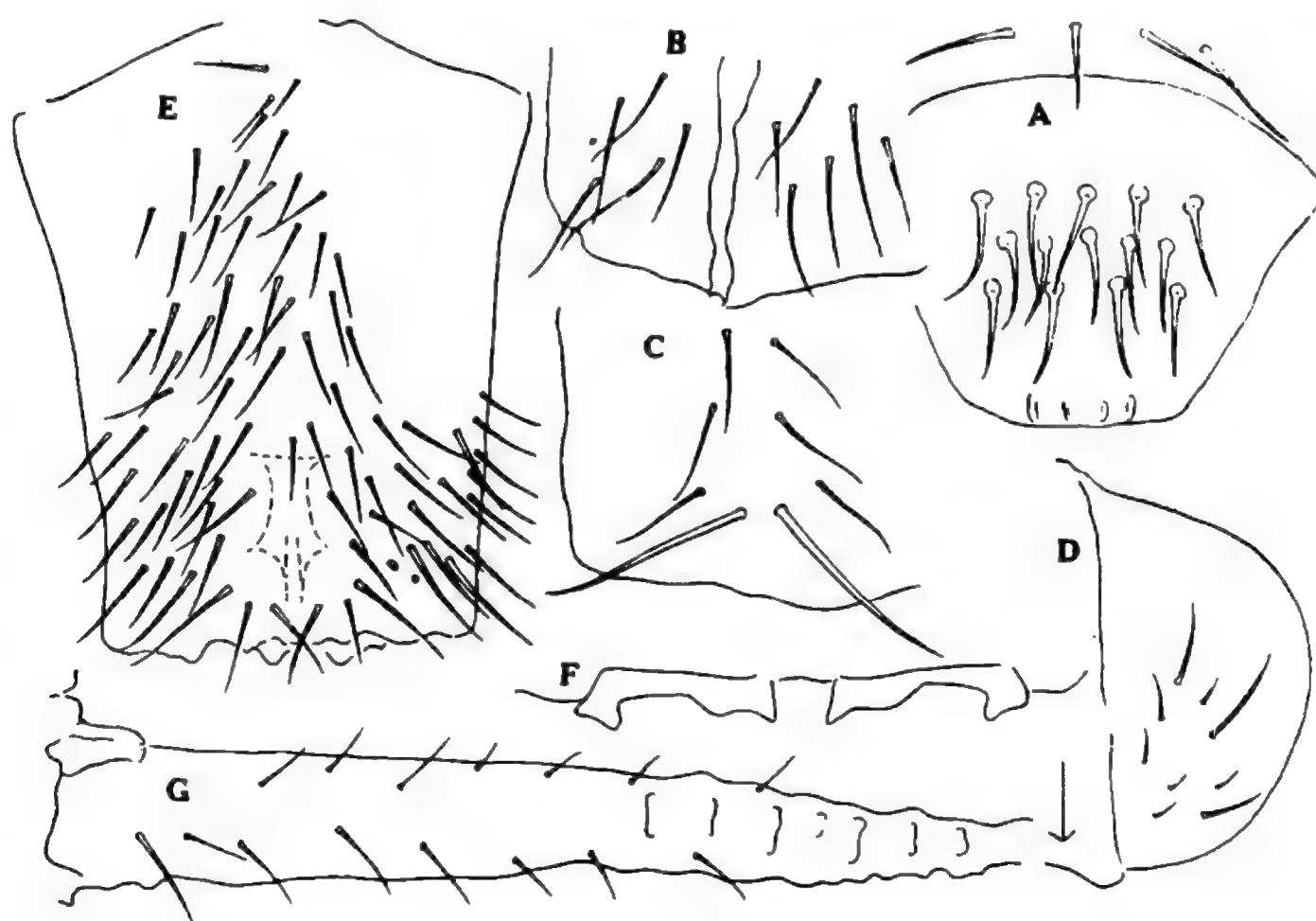


Fig. 16. *Desoria (Desoria) yukanomi* (YOSII)

A : Labrum; B,C: Ventral tube (anterior and posterior face); D : Lateral flap of ventral tube; E : Ventral view; of manubrium; F : Marginal thickening of manubrium; G : Dorsal view of dentes.

and externally with a corniculated process. Dentes dorsally with 2 basal, 6 outer and 6 inner setae in full mature examples.

***Desoria (Pseudisotoma) sensibilis* (TULLBERG) (Fig. 17)**

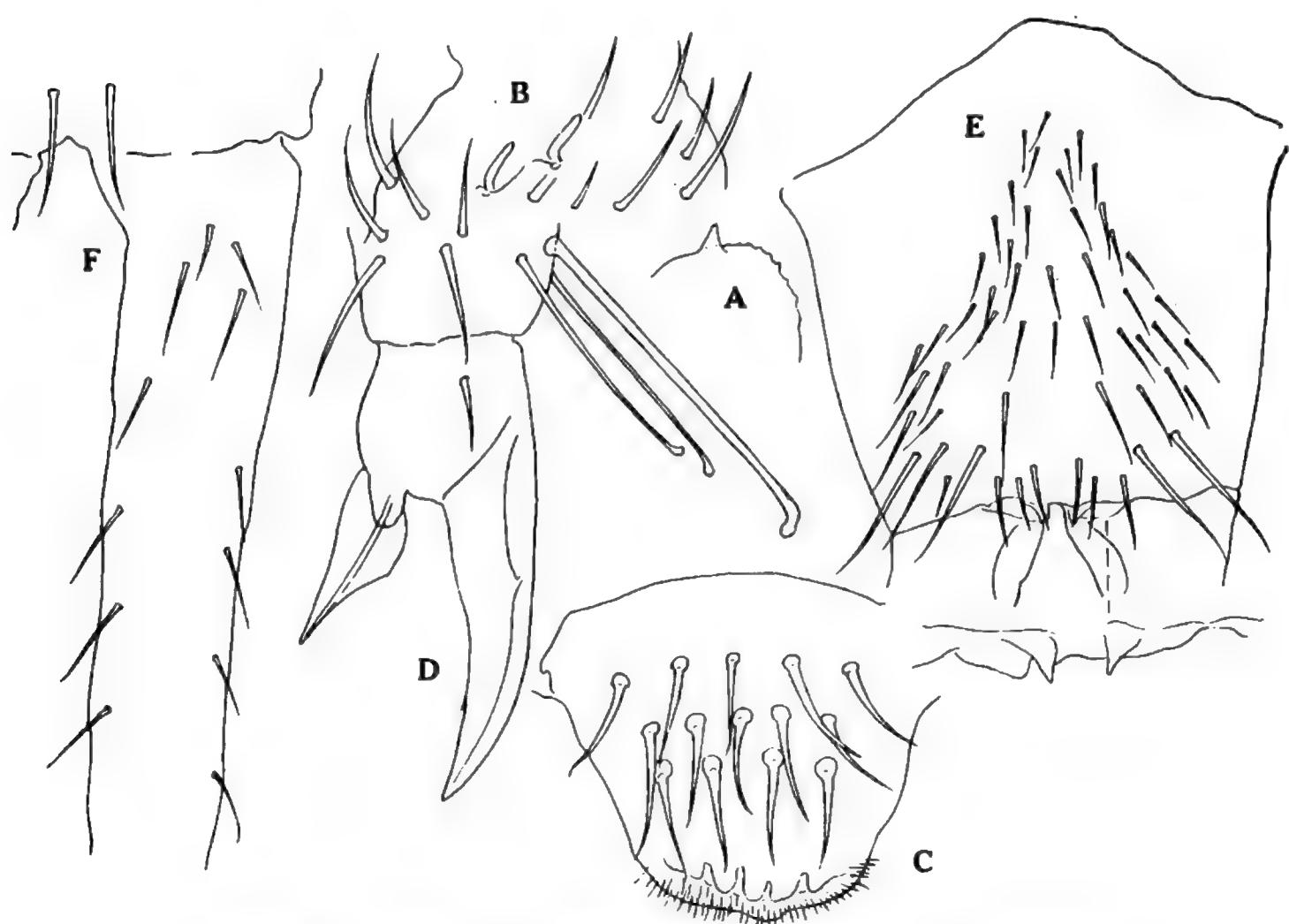
4 expl. Oetztal, Tirol, Austria, H. JANETSCHEK leg.

2 expl. Uji near Kyoto, Japan, 9. V 1951 R. YOSII leg.

The species is well described in STACH (1947). The following notes are to be added: Distal end of ant. IV with a small papilla. Ant. III-organ is composed of 2 blunt rods in a shallow common groove. Labral setae 5, 5, 4, each upon heavy basal socket. Distal margin with 2+2 short longitudinal ridges and heavily ciliated. Tentorial hair 2, 3, 3, the median one larger than others. Ventral tube rather long, anteriorly with ca. 13+13 setae and posteriorly with about 35 equally long setae. Lateral flap has 3 setae each. Manubrium dorsally hirsute and ventrally with triangular hirsute area, distal median setae shorter than lateral ones. Marginal thickening is low and with one prominent spine. Dorsal side of dentes with 6 inner and 6 outer setae.

The name *Pseudisotoma* HANDSCHIN (1924) has a subgeneric value.

Distribution: Europe, North America, Java and Japan (nov.)



**Fig. 17. *Desoria (Pseudisotoma) sensibilis* (TULLBERG)**  
**A : End of ant. IV; B : Ant. III-organ; C : Labrum;**  
**D : Hind claw; E : Ventral side of manubrium F : Dorsal**  
**view of dentes (proximal part).**

*Desoria (Vertagopus) cf. montana* (STACH) (Fig. 18, E-H)

3 expl. Oetztal, Tirol, Austria, H. JANETSCHEK leg.

The form is very near the description of *Desoria montana* of STACH (1947) and GISIN (1960), but has no inner tooth of the unguis and the dentes are not divergent distally. Colour intensely black upon tergites and upon extremities. Labral margin has 2+2 short, faint longitudinal ridges. Probably the name *Vertagopus* does merit a subgeneric value.

*Desoria olivacea* (TULLBERG) (Fig. 18, A-D)

30 expl. Liége, Belgium, F. CARPENTIER leg.

The species has been also well described by STACH (1947). The following notes are added: Labral setae normal, upon papillae. Labral margin entire and without longitudinal ridges of any sort. The margin is only fringed with minute cilia. Ventral tube anteriorly with 3 or 4 pairs of setae equal in length. Posterior face has 4 pairs of setae and lateral flap of the tube bears 4 setae each. Corpus tenaculi with setae up to 8. Manubrium hirsute as in *D. yukinomi*. Dorsal side of dentes bears setae up to 2 basal, 7 inner and 7 outer.

That the labral margin has no ridges nor tubercles implies the presence of a

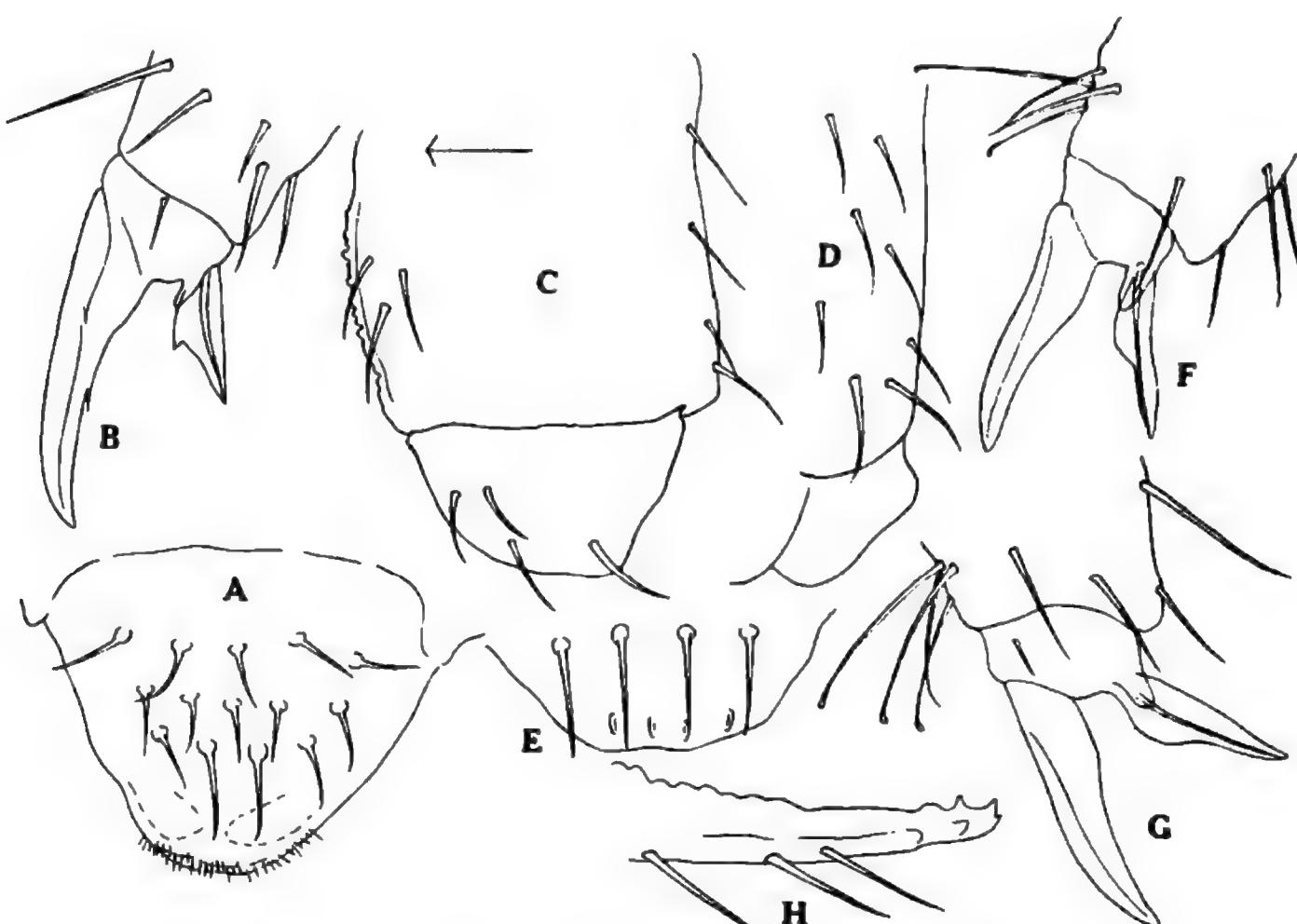


Fig. 18. *Desoria (Desoria) olivacea* (TULLBERG)

A : Labral margin; B : Fore claw; C : Ventral tube (lateral view); D : Ventral tube (post. lat. view) *Desoria (Vertagopus) cf. montana* (STACH); E : Labral margin; F : Fore claw  
G : Hind claw; H : Mucro

special group within the genus *Desoria*.

***Isotomurus* BÖRNER 1903**

This is one of the most problematic genera of Isotomidae. Such species as *I. alticulus*, *subterraneus*, which have distinct morphological peculiarities, are relatively easy to distinguish from others, but those related to *I. palustris* are not easy to separate from each other, even when their body colour is specialized and their habitat is strictly separated. An intensive study of KOS (1938) throws some light to the problem, and my experience with Asiatic forms of the genus suggests the conclusion that each forms with special body pattern represents, if not transient, an independent species, having some very minute morphological differences. Systematic character newly adopted in this paper is the chaetotaxy on the lateral flap of ventral tube. It is usually 3+3, but sometimes more than that (*alticulus*, *punctiferus*). Marginal thickening of the manubrium is not much variable except in *I. annectens* and *I. infuscatus*.

- A Lateral flap of ventral tube each with more than 15 setae
  - B Unguis and mucro elongated ..... *I. alticulus* (CARL).
  - BB Unguis and mucro not elongated ..... *I. punctiferus* sp. n.
- AA Lateral flap of ventral tube each with 3 setae
  - B Mucro atypical for the genus (fig. 23, H.) Manubrial marginal thickening with two spines ..... *I. annectens* sp. n.
  - BB Mucro typical for the genus. Manubrial thickening with one spine
    - C Unguis and mucro elongate. Ant. III-organ within a common groove ..... *I. takahashii* (YOSII).
    - CC Unguis and mucro not elongate. Ant. III-organ standing freely
      - D Unguiculus with an inner tooth ..... *I. cf. aquatalis* (MÜLLER).
      - DD Unguiculus without an inner tooth ..... *I. cf. prasinus* (REUTER).
  - BBB Mucro typical for the genus. Manubrial thickening with many spines ..... *I. infuscatus* sp. n.

***Isotomurus* cf. *aquatalis* (MÜLLER) (Fig. 19)**

*Isotoma aquatalis*: LUBBOCK 1873

*Isotomurus palustris* f. *aquatalis*: STACH 1947

2 expl. Campus of the British Museum, London, England, P. N. LAWRENCE leg.

4 expl. Casa de Campo, Madrid, Spain, 1. V 1946, R. YOSII leg.

Body length 2.0 mm. Ground colour brownish gray. Antennae red violet distally. Upon head the antennal basis, eyes, frontal spot and posterior margin are intensely black. Trunk with a median dorsal streak from th. II to abd. V. Dorsolateral longitudinal streaks are broad, somewhat warty and irregular. Ventral

side dark. Posterior margin of each tergites and coxal basis with a narrow black marginal stripe. A pair of lateral flaps of anus is intensely pigmented, while a dorsal flap is pale. Legs diffusely reddish violet upon tibiotarsus. Others and furcula pale. The colouration seems to be considerably variable, some being paler than others, but not different in principle and coincide well with the figure given by LUBBOCK in 1873, pl. 37. Ant. / head as 9 : 5. Ant. ratio as 30 : 50 : 55 : 60. Ant. IV distally with a small conical papilla. Ant. III-organ is two curving rods in a shallow common groove accompanied by some 2-3 sensory setae apart from them. Prelabral setae 2+2, median ones are located far apart. Labral margin with two pairs of longitudinal streaks slightly curved to the side. They are connected along the margin and outer ones are slightly longer than the inner ones. Anterior margin is ciliated on both sides, the median part being glabrous. Eyes 8+8. Postantennal organ is elongate elliptical, as long as an eye in diameter. Unguis with minute dorsal and a pair of lateral teeth, ledges connecting them are almost invisible. One minute inner tooth is very indistinct and only to be traced by the chitinous thickening. Unguiculus acutely ending and with one projecting inner tooth. Tenent hair one, needle-like. Ventral tube both anteriorly and posteriorly with many setae, including 1+1 larger terminal ones of posterior face. Lateral flaps of the distal part with 3 setae each (fig. F) Rami tenaculi quadridentate, corpus with

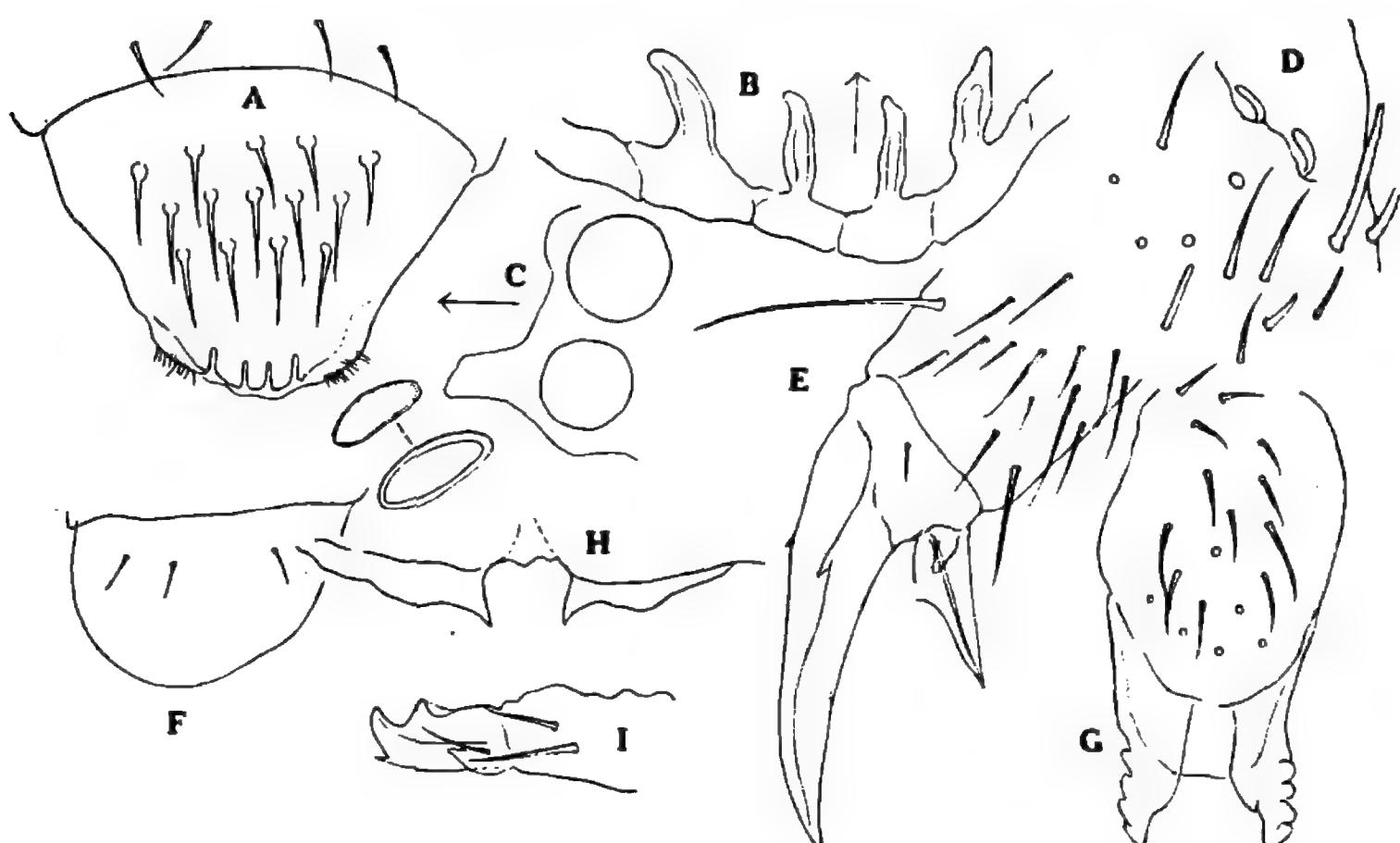


Fig. 19. *Isotomurus* cf. *aquatalis* (MÜLLER)

A : Labrum; B : Labral margin; C : Postantennal organ  
 D : Ant. III-organ; E : Hind claw; F : Lateral flap of ventral tube;  
 G : Tenaculum; H : Marginal thickening of manubrium;  
 I : Mucro

ca. 18 subequal setae. Furcula with man : d as 11 : 20. Manubrium dorsally hirsute with many smooth setae, ventral side has triangular hirsute area, distal setae longer, but not modified. Marginal thickening low, interiorly with one spine. Dentes tapering, ventrally setaceous and dorsally with numerous minute setae dispersed uniformly upon proximal 2/3 of the whole length. Mucro quadridentate, not elongate and with usual structure of the genus. Small body setae are smooth. Larger setae of abd. V and VI as well as those upon tibiotarsus are distinctly feathered to all sides. *Setae sensuales* are filiform and feathered.

The present species comprises one of the "palustris-complex" of Europe. It is almost equal to *Isotomurus maculatus* (SCHÄFFER, 1896) in colour pattern, but different from *Isotomurus palustris* f. *principalis*, which has only a median dorsal stripe of the body. Morphologically it is near *Isotom. palustris* of STACH (1947) and to *Isotom. maculatus* of KOS (1938). From *Isotomurus* cf. *prasinus* it is to be distinguished by unguis, unguiculus and, above all, by the structure of labral margin.

#### *Isotomurus* cf. *prasinus* (REUTER) (Fig. 20)

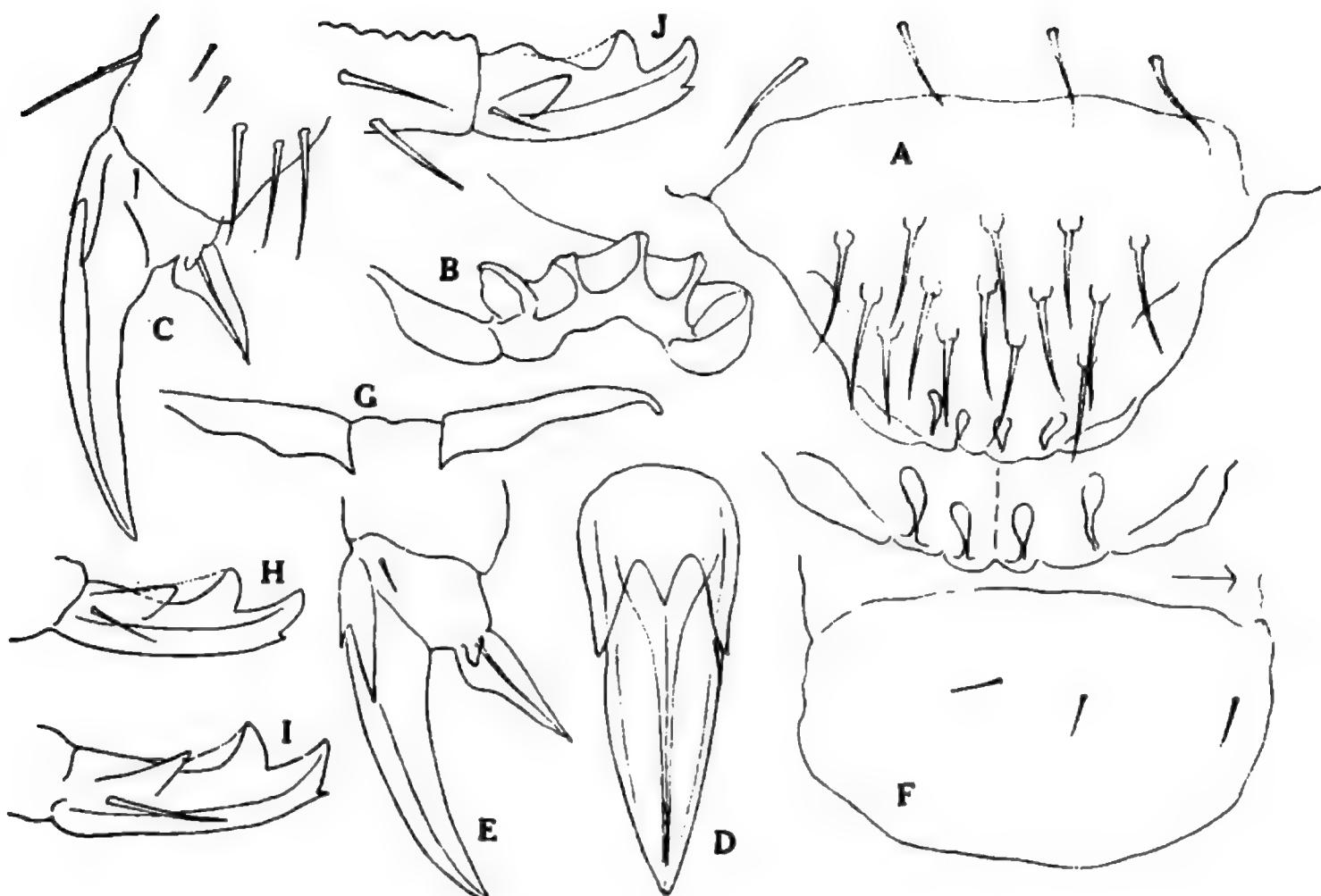
Syn. *Isotomurus palustris* f. *prasina* : YOSII 1954

4 expl. Ozé, Japan, 7. IX 1952, R. YOSII leg.

2 expl. Ryū-no-Iwaya, Tokushima Pref., Japan, 27. III 1953, S. UÉNO leg.

Body length up to 2.0 mm. Colour uniformly greenish to green gray. Antennae reddish violet distally. Other extremities pale. Ant. IV distally with a conical papilla. Ant. III-organ is composed of two sensory rods each in shallow groove and accompanied by 2 obscure sensory setae near by. Labrum with 2+2 prelabral setae not in equal distances. Labral margin has two pairs of longitudinal streaks. They are rather high, inner ones shorter than the outer and their outline is claviform, when viewed from above (fig. A). Eyes 8+8, subequal. Postantennal organ broadly elliptical and as long as an eye in diameter. Tenent hair short and slender, rather needle-shaped. Unguis with a dorsal and a pair of lateral teeth connected by a slight ledge. No inner tooth is observed. Unguiculus is also untoothed. Rami tenaculi quadridentate, corpus with ca. 20 subequal setae. Ventral tube anteriorly and posteriorly with many setae, including 1+1 posterior terminal ones larger than others. Lateral flap has 3 minute setae each. Furcula with man : d as 18 : 29. Manubrium dorsally hirsute equally, ventral side with triangular hirsute area, whose distal setae are not modified. Marginal thickening is low, with one internal spine. Dentes ventrally hirsute equally. Dorsal side is minutely and equally setaceous upon proximal half. Dorsal crenulation begins from the hirsute portion of dentes and reaching just before the mucro. The latter is quadridentate, relatively elongated, the third tooth with proximal lamellae and with an outer basal seta. Body setae are feebly developed, smooth and almost uncoloured. *Setae sensuales* feathered on all sides. Larger setae of body and legs are also smooth.

The species, which is hitherto regarded a forma of *Isotomurus palustris* (MÜL-



**Fig. 20. *Isolomurus cf. prasinus* (REUTER)**

A, B: Labrum; C : Fore claw; D, E: Hind claw (dorsal and lateral view); F: Lateral flap of ventral tube; G : Marginal thickening of manubrium; H, I: Mucro

LER), is characterized by the fusiform outline of dorsal streaks of labral margin as well as by undentated unguis and unguiculus. *Isotomurus palustris* described by KOS (1938) from Yugoslavia seems to be referable to the present species. As stated above, *Isotomurus palustris* of STACH (1947) is, however, different from the present species and is more nearly related to *Isotomurus aquatilis* (MÜLLER) of this paper. *Isotomurus palustris* var. *prasina* in FOLSOM (1919) from Canada has no inner tooth of unguiculus. It is probably identical with the present form. But it is not assured whether the present Japanese form is identical with the true *prasinus* of Northern Europe, the mucro being slightly elongated. Further researches are needed.

#### ***Isotomurus alticolus* (CARL) (Fig. 21)**

*Isotomurus alticolus*: STACH 1946, 1947

7 expl. Stubaital, Tirol, Austria, R. YOSII leg.

Morphological details of this alpine species have been well investigated by previous authors. Only some additional notes are given; antennae with a subterminal conical process. Ant. III-organ is a pair of free standing rods accompanied by some 2 feeble sensory setae. Postantennal organ always unusual in shape and

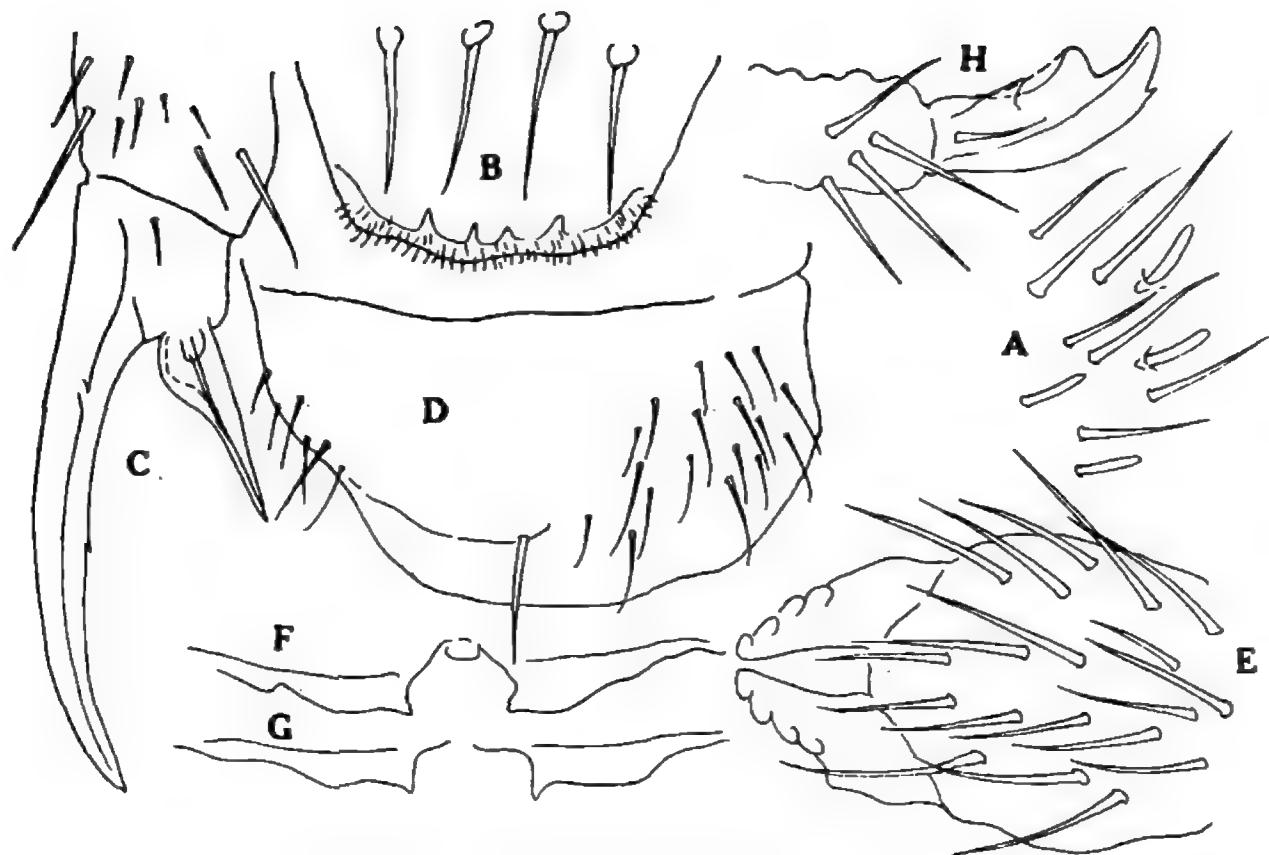


Fig. 21. *Isotomurus alticulus* (CARL)

A : Ant. III-organ ; B : Labral margin ; C : Mid claw ;  
 D : Lateral flap of ventral tube ; E : Tenaculum ;  
 F, G : Marginal thickening of manubrium ; H : Mucro

tends to be in two lobes. Labral margin with two pairs of short ridges, whose outline is in surface view triangular in shape. Anterior edge is uniformly ciliated. Unguis of all examples are elongated, with one minute inner tooth. Dorsal tooth vestigial and no ledge is to be found to connect it with a paired lateral teeth. Unguiculus also elongate, without tooth. Ventral tube anteriorly with many equal setae. Posterior face also hirsute and terminal median pair is stronger than others. Lateral flap has remarkably more than 15 minute setae (fig. D). Rami tenaculi quadridentate, corpus with more than 20 subequal setae. Furca with man : d as 17 : 31. Manubrium is hirsute dorsally with many smooth setae. Ventral side has triangular hirsute area and all setae are smooth. Terminal thickening is brown, very low and internal spine is either present or absent, when present it is very small. Dentes elongate, ventrally hirsute with uniform short setae, dorsally with minute setae uniformly dispersed upon proximal half. Mucro quadridentate, elongate and typically built as in fig. H.

Not only by the elongate unguis, unguiculus and mucro, but also by multi-setaceous lateral flap of the ventral tube, the species is very conspicuous. Labral structure is also characteristic.

#### *Isotomurus punctiferus* sp. n. (Fig. 22)

10 expls. Shuri, Okinawa, 26. III 1959 M. NISHIHIRA leg.

Body length up to 2.6 mm. Ground colour grayish white. Antennae reddish

violet, distal parts of each segments banded purple. Head on anterior margin and frontal spot intensely black. Trunk with a narrow median longitudinal streak from th. II to abd. III. Anterior margin of each tergites narrowly banded. Lateral part of all segments with suffusion of pigments. Upon abd. II-IV there are small black spots in 3, 3, 1 pairs each representing the place of insertion of *setae sensuales* (= *bothriothrix*). Ventral tube and tibiotarsus diffusely violet. Ant. / head as 5 : 2. Ant. ratio as 8 : 14 : 11 : 15. Ant. IV distally with a small conical seta and some slender curving setae. Ant. III-organ is a pair of sensory setae inclined to one side and in a shallow independent groove, accompanied by 1-2 obscure sensory setae. Labral setae 5, 5, 4, all of them upon high papillae. Labral margin has, as in other species of *Isotomurus*, with 2+2 high longitudinal ridges. Eyes 8+8, equal in shape. Postantennal organ is narrowly elliptical, often with a slight notch at about the middle and longer than an eye in diameter. It is located somewhat apart from the nearest eye. Unguis with a dorsal and a pair of lateral teeth connected by ledges as in *I. tricuspis* (cf. fig. F). No inner tooth. Unguiculus acute, outer lamella is rounded basally and with a minute inner tooth in all legs. Tenant hair one, slender

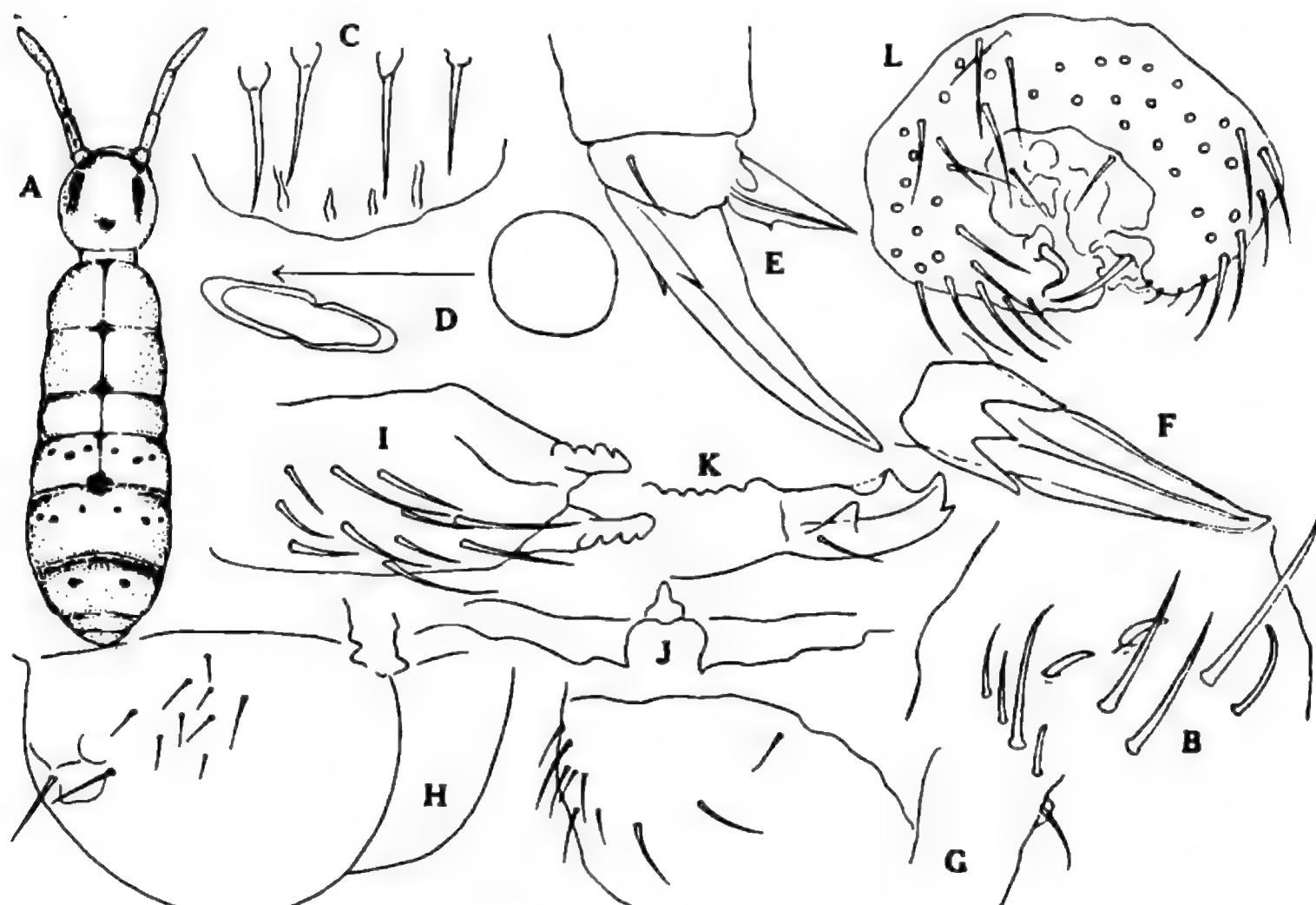


Fig. 22. *Isotomurus punctiferus* sp. n.

- A : Habitus;      B : Ant. III-organ;      C : Labral margin;
- D : Postantennal organ;      E : Fore claw;      F : Hind claw  
(dorsal view);      G, H : Ventral tube (post. lat. and ant. lat. view);
- I : Tenaculum;      J : Marginal thickening of manubrium;
- K : Mucro

and long. Ventral tube has posteriorly about 30 stout setae. Anterior face has some 20 pairs of feeble setae. Lateral flap of it has remarkably many setae; ca. 7-15 on anterior, 2 on lateral and 1-0 on posterior part of it. Rami tenaculi quadridentate, corpus bearing 10-20 setae, the number is variable. Genital opening of the male has a broad ring having many small setae and a central cone is beset with 2+2 setae, one pair stronger than others. Man:d as 15:32. Manubrial setae equally distributed dorsally. On ventral side of it setae are upon triangular area, leaving a narrow median glabrous zone distally. Marginal thickening weakly developed, low and with one internal spine. Dentes intensely hirsute ventrally. Dorsal side is hirsute upon proximal one third, sparsely setaceous upon next one third and glabrous distally. Mucro not elongated and quadridentate as usual, the third tooth with a proximal lamella. Mucronal outer seta present. Body setae are smooth, rather short. *Setae sensuales* are feathered to all sides and, as stated above, 3, 3, 1 pairs upon abd. II-IV. Longer setae of abd. V, VI and of mid- and hind tibiotarsus are ciliated to all sides.

The species is characterized by its peculiar pattern of the body. It is also distinguished by the chaetal arrangement upon lateral flaps of the ventral tube.



### *Isotomurus annectens* sp. n. (Fig. 23)

4 expl. Uh Lai, Formosa, 24. X 1960, R. Yosii leg.

Body length up to 1.8 mm. Colour uniformly reddish gray, including legs. Distal part of antennae and median spot of head deeper pigmented. Ant./head as 9:5. Ant. ratio as 26:45:53:55. Ant. IV with a subapical conical papilla ending in a small seta. Ant. III-organ is a pair of inclined rods in a common groove with a slight ledge, accompanied by two obscure sensory setae. Eyes 8+8, black and subequal. Postantennal organ is very narrow, as large as an eye in diameter. Labral margin with 2+2 short ledges as in other species of *Isotomurus*. Unguis not elongated, with a dorsal and a pair of lateral teeth connected by ledges. No inner tooth. Unguiculus pointed apically and with or without an inner tooth. Ventral tube setaceous, 1+1 terminal setae of posterior face larger than others. Lateral flap has 3+3 setae. Rami tenaculi 4 toothed, corpus with ca. 16 setae. Furca in ratio as 4:7. Manubrium hirsute uniformly, both dorsally and ventrally with smooth setae. Terminal thickening is very thin, uncoloured and remarkably with 2-3 small spines upon interior part. Dentes dorsally with numerous small setae uniformly scattered upon proximal half. From the middle it is crenulated, leaving distally a smooth portion about 3 times the length of mucro. Ventral side of dentes is uniformly hirsute and inner laterally with 1-2 rows of longer setae, all smooth. Mucro is peculiar, an apical tooth is strongly elongated and converging distally, an antepical smaller and a basal outer tooth also short, pointed backwards. A small ventral tooth is either present or absent. No outer mucronal seta is to be found. Body clothed with many smooth setae. Larger body setae upon distal

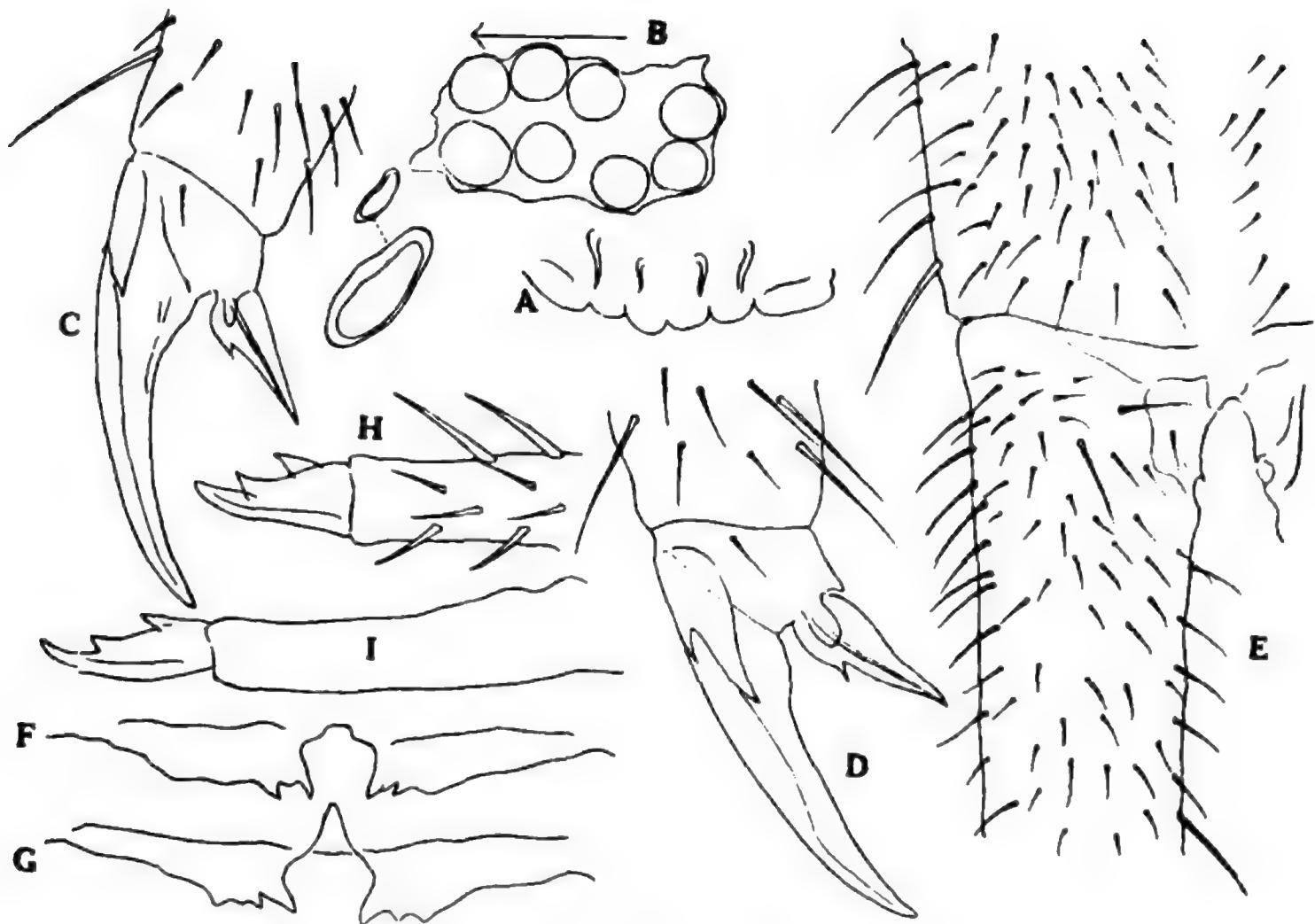


Fig. 23. *Isotomurus annectens* sp. n.

A : Labral margin ; B : Eyes and postantennal organ ;  
 C, D : Fore- and hind claw ; E : Dorsal view of manubrium and dentes ; F, G : Marginal thickening of manubrium ;  
 H, I : Mucro

abdominal segments are also smooth and not feathered, but those upon tibiotarsus are slightly feathered. *Setae sensuales* are filiform and serrated on all sides.

The species is very remarkable by the form of the mucro and by the marginal thickening of manubrium. Examples with shorter body length (ca. 1.2 mm.) have the mucro quadridentate as usual for *Isotomurus*. Probably this is a kind of epi-morphosis, as it may happen also in *Agrenia*, whose juvenile form is quite near *Isotomurus* in mucronal structure. The form of mucro in this new species is near that of *Isotomurus obscurus* CARPENTER (1916) from Seychelles, from which the present species is different only in the form of the postantennal organ. Body colour is alike to *Isotomurus palustris* f. *fucicola* REUTER. This Finnish form is probably an independent species which, according to LINNANIEMI (1912, p. 191) "unterscheidet sich von der Hauptform und allen anderen Varietäten durch schlankeres Denten, welche nicht bis zur Spitze geringelt sind und durch kleinere Mucrones, deren Anteapikalzahn die übrigen Zähne an Grösse weit übertrifft. Der erste Zahn liegt dadurch fast in der Mitte des Mucro (scheinbar ventral) tatsächlich aber an der Aussenkante".

*Isotomurus takahashii* (YOSII) (Fig. 24)

*Isotoma takahashii*: YOSII 1940

6 expl. Gokwan, Formosa, 13, VIII 1939, (paratype), R. TAKAHASHI leg.

The species is incompletely described by the author. Following notes are to be added. Ant. IV distally with a small conical process. Ant. III-organ is a paired curving rods in a distinct common groove, provided with a distinct ledge of the integument. No accessory sensory setae are observed. Labrum with normal chaetotaxy. Marginal streak in two pairs, attaining the labral edge, where they are connected by the marginal thickening. Ciliation is presumably only on lateral lobe of the edge. Unguis very narrow, with a pair of lateral teeth. No dorsal and no inner tooth. Ventral tube hirsute, with feeble setae on both faces, 1+1 terminal setae of posterior face are larger than others. Lateral flap of the tube with 3 setae each. Rami tenaculi quadridentate, corpus with ca. 7 setae. Furcula with man:d as 1:2. Manubrium dorsally hirsute uniformly. Ventrally with triangular hirsute area. Setae of the postero-lateral portion are enlarged and slightly ciliated. Marginal thickening is low, un conspicuous and with a spiny corner internally. Dentes hirsute ventrally. Setae of the dorso-lateral rows are longer than these, but not modified. Dorsal part of dentes with minute setae upon proximal 2/3 of the whole

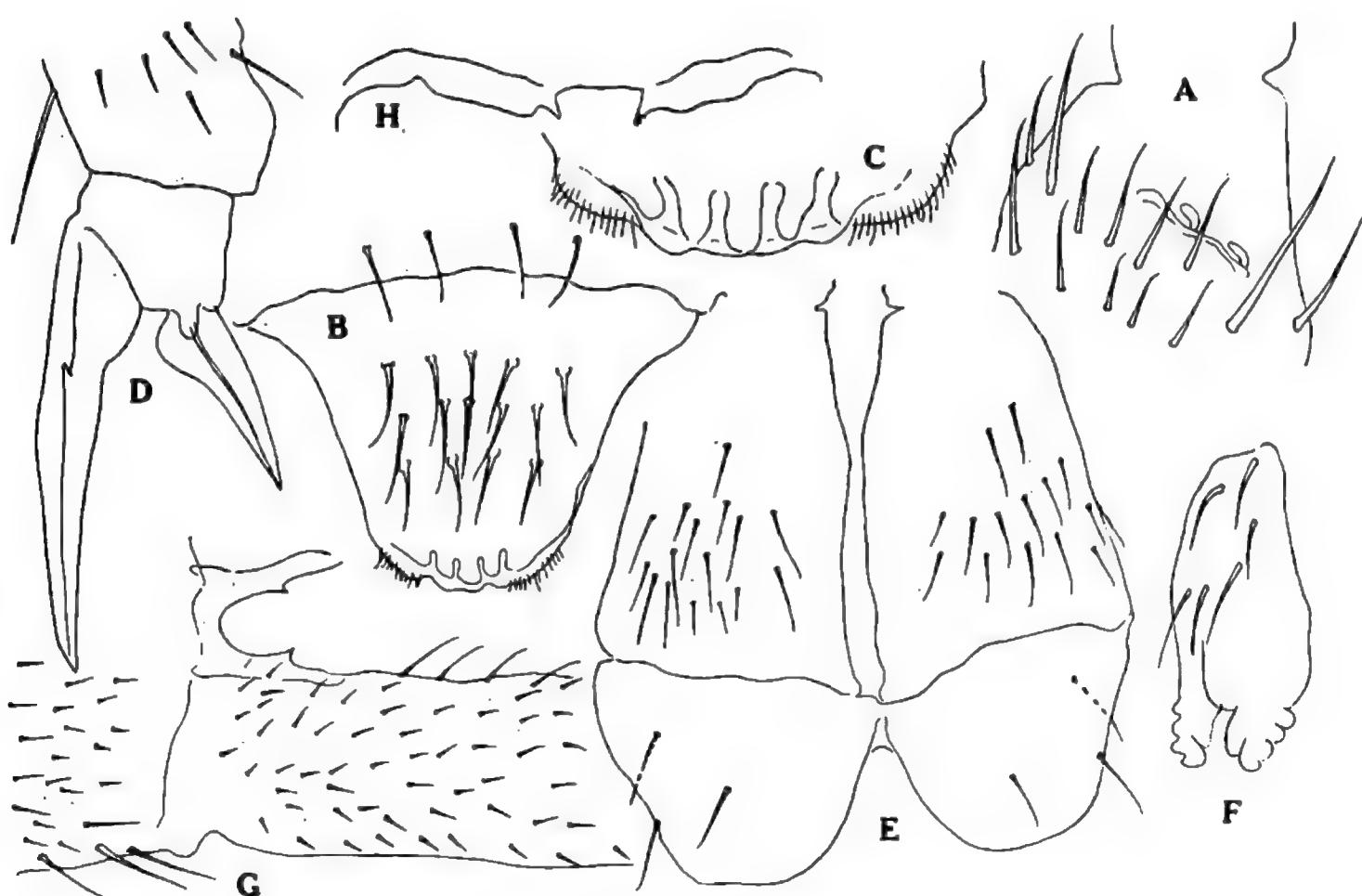


Fig. 24. *Isotomurus takahashii* (YOSII)

- A : Ant. III-organ ; B : Labrum ; C : Labral margin ;
- D : Hind claw ; E : Ventral tube (anterior face) ;
- F : Tenaculum ; G : Dorsal view of dentes (proximal part) ;
- H : Marginal thickening of manubrium

length. Crenulation is ending directly before the mucro, which is quadridentate, lamellate on the third tooth, etc. An outer mucronal seta is not observed in all the examples examined. Body setae are usually smooth; some larger ones from abd. V, VI are distinctly serrated. *Setae sensuales* were previously overlooked, but they are rather short, filiform and ciliated on all sides.

The species is to be distinguished from usual *Isotomurus* by elongate unguis. From *I. alticolus* it is different by 3+3 setae upon lateral flap of the ventral tube. Ant. III-organ with a common groove is also peculiar for the genus. *Isotomurus alticolus japonicus* YOSII (1956) from Japanese caves is identical with this species.

### *Isotomurus innominatus* A (Fig. 25)

2 expl. Taiwarra, Afghanistan, 3. IX 1955, T. UMESAO leg.

Body length 1.2 mm. Colour uniformly brownish yellow, antennae dark violet. No markings of the body except a median spot of the head. Antennae short, 1.5 times the length of head (shriveled?). Ant. III-organ is two free standing rods. Eyes 8+8, subequal and black. Postantennal organ is broadly elliptical, as long as an eye in diameter and slightly notched at the middle. Labral margin with 2+2 short longitudinal ridges as in other *Isotomurus*. Unguis with a dorsal and a pair of lateral teeth, but without ledges connecting them. Inner tooth is absent both in unguis and unguiculus. Rami tenaculi quadridentate, corpus with ca. 10 setae. Ventral tube not well observed. Male genital orifice in one example has a multi-setaceous ring with a central cone, having 2-3 pairs of small setae. Furca with man : d as 7 : 17, the dentes being much longer than usual of the genus (shriveled?). Manubrium hirsute with many simple setae. Distal marginal thickening low, with one internal spine. Dorsal side of dentes with some small setae on proximal 1/3 of the segment; they are rather scarce in number compared with other species. Dorsal crenulation is ending just before the mucro. Mucro very small, quadridentate as

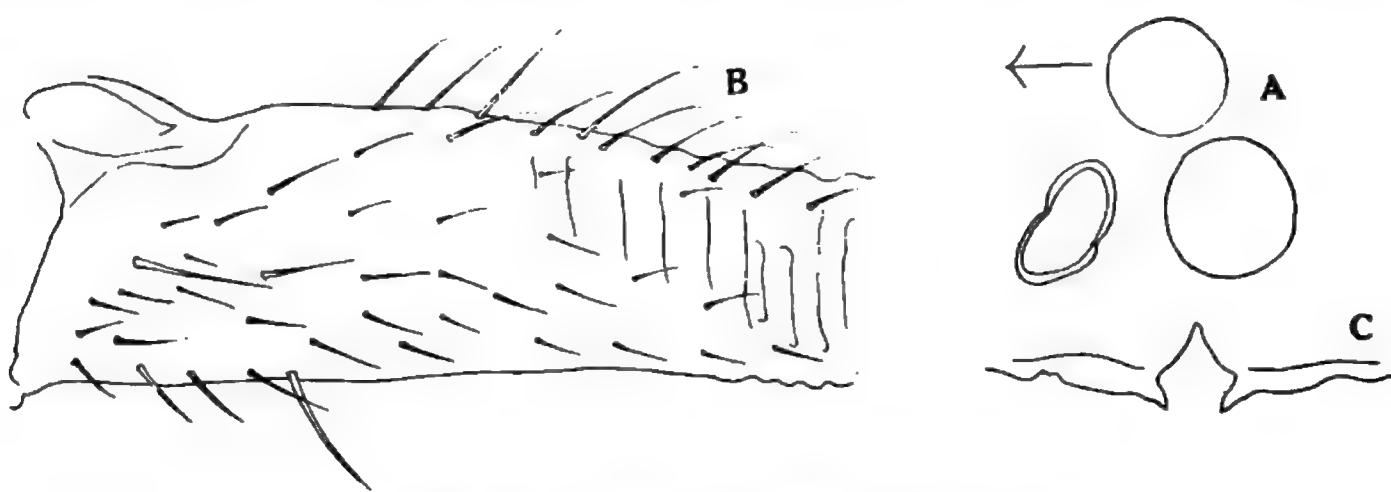


Fig. 25 *Isotomurus innominatus* A

A : Postantennal organ; B : Dorsal view of dentes (proximal part); C : Marginal thickening of manubrium

usual and with an outer mucronal seta. Body setae simple, larger setae of posterior abdominal segments are distinctly feathered. *Setae sensuales* filiform and ciliated.

The present Afghanistan species is near *Isotomurus prasinus* (REUTER) in many respects, but body colour is brownish yellow and dental dorsal setae are fewer in number. Ratio of man : d is different and posttentennal organ is notched at the middle. From two shrivelled examples at hand, however, it is impossible to determine the species exactly.

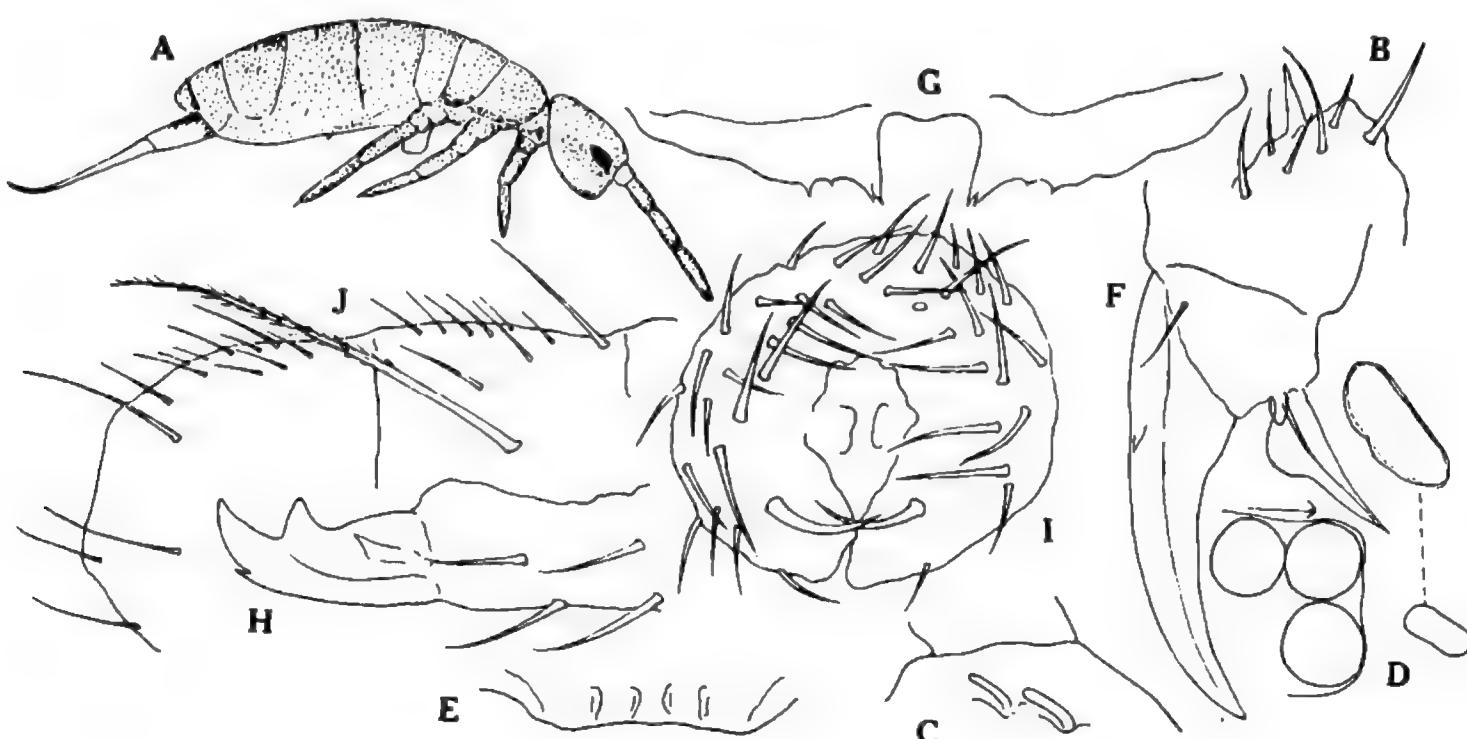
***Isotomurus infuscatus* sp. n. (Fig. 26)**

Syn.: *Isotomurus palustria* f. *fucicola*: YOSII 1955

5 expl. Tanegasima, Japan, 22. X 1955, R. YOSII leg.

1 expl. Nakanoshima, Tokara, Japan, 12. VI 1953, S. UÉNO leg.

Body length up to 1.5 mm. Colouration uniformly dark violet, dorsal side of the trunk mottled with pale spots and stripes in a symmetrical way. Antennae and legs are dark all over. Ventral tube pale. Furcula lightly pigmented dorsally upon manubrium. Ventral side of the trunk paler. Ant. / head as 15 : 9. Ant. ratio as 20 : 35 : 34 : 40. Ant. IV subapically with a slender, conical papilla. Ant. III-organ is two blunt rods standing in separate shallow grooves. No accessory setae observed. Postantennal organ elliptical, as long as an eye in diameter and often slightly notched at the middle. Eyes 8+8, but G and H are smaller than others. Labral margin has 2+2 short longitudinal elevation as in case of *I. punctiferus* sp. n. Unguis not elongated, without inner tooth, but with a pair of lateral teeth. Neither dorsal tooth



**Fig. 26. *Isotomurus infuscatus* sp. n.**

A : Habitus; B : End of ant. IV; C : Ant. III-organ; D : Postantennal organ; E : Labral margin; F : Hind claw; G : Marginal thickening of manubrium; H : Mucro; I : Male genital field; J : Setae of distal two abdominal segments

nor dorso-lateral ledge is to be found. Unguiculus acute, rounded on inner margin, but without tooth. Ventral tube typically beset with setae for the genus and lateral flap has 3 minute setae each. Rami tenaculi quadridentate, corpus with 8 setae. Furcula long, man : d as 3 : 5. Manubrium is hirsute both dorsally and ventrally, its marginal thickening is strikingly with 3-4 small spinous processes. Dentes ventrally hirsute, dorsal side is uniformly hirsute upon proximal half and distal smooth portion is as long as mucro. Mucro is quadridentate, but it is rather long and the outer basal tooth is not very conspicuous. No mucronal seta is to be observed in all examples examined. Male genital area is rounded, with a hirsute ring, bearing a basal pair of setae larger than others. Integument is strongly hirsute. *Setae sensuales* ciliated as usual and some larger setae of abd. V and VI are strongly feathered. All these body setae are slightly brown in colour.

This new species, which I have hitherto regarded as *f. fucicola* REUTER of *Isotomurus palustris* (MÜLLER), is different from *I. cf. prasinus* by the marginal thickening of manubrium and feathered larger setae of abd. V and VI. In colouration it is near *I. annectens* sp. n. with which the species is probably a near relative by the absence of lateral mucronal setae and in the form of manubrial marginal thickening, but claws have no teeth and mucro is not modified.

\* \* \* \* \*

PS.

1. *Isotoma anglicana* LUBBOCK in this paper corresponds to *Isotoma viridis* var. *coerulea* BOURLET (1839) of PALISSA, A. 1960 (Deut. Entom. Zeits. NF, 7: 378-379).
2. *Isotomurus punctiferus* YOSII: The species is also found in Lahore, West Pakistan, 14. IX 1952, 40 expls., M. ASHRAF coll. Body colouration and morphological details are just the same with the Okinawa examples.
3. For *Isotomurus balteatus* (REUTER, 1876) see YOSII, R. et C. LEE (1963): On some Collembola of Korea, etc. (Contr. Biol. Lab. Kyoto Univ. no. 15, p. 3).

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- 1959 On some Collembola from Malay and Singapore. Contr. Biol. Lab. Kyoto Univ., no. 10.

ARTICLE II | ASAHLNA : ODONATA



## II.

# Odonata taken by Japanese Expeditions to Karakoram, Afghanistan, Iran and Pakistan

(1 text-figure)

Syoziro ASAHLINA\*

In this report are listed the Odonata taken by the Japanese scientists during the four expeditions to Karakoram in 1938, Afghanistan in 1955, Iran in 1956, and Pakistan in 1957. These insects total thirty-two specimens which represent twelve species. For the identification of Iranian species of the genus *Ischnura*, I owe to Dr. Erich SCHMIDT, Bonn a. Rh., whom I should express my cordial gratitude.

## I. The Odonata taken by Chogo Liza conquest party in Karakoram in 1938

### Family LIBELLULIDAE

#### 1. *Orthetrum brunneum brunneum* (FONSCOLOMBE, 1837)

1 ♂ (damaged) Skardu-Shigare, Baltistan.

1 ♀ (damaged) Ascoli, Baltistan, 26. VI. 1938.

The female specimen is rather small with the hind-wing 28 mm in length.

#### 2. *Crocothemis servilia* (DRURY, 1773)

1 ♂ (damaged) Skardu-Shigare, Baltistan, 21. VI. 1938.

An extremely small specimen, hind-wing 25 mm.

## II. The Odonata taken in Afghanistan in 1955

The Odonate fauna of Afghanistan have not sufficiently been surveyed. It seems to have a number of common species with Northwest India. There are also a considerable number of rather widely distributed Mediterranean species. It was somewhat surprising that the three species recorded below are all new additions to the list of Mr. KIMMINS (1951).

### Family LESTIDAE

#### 1. *Lestes barbarus* (FABRICIUS, 1798)

1 ♀ Kabul, 2. VII. 1955, leg. UMEASO.

\* Tokyo, Totsuka, III-123, Shinjuku-ku.

A Mediterranean species reaching as east as Kashmir and N. W. India (FRASER, 1933).

### Family AESCHNIDAE

#### 2. *Anax parthenope parthenope* (SELYS, 1938)

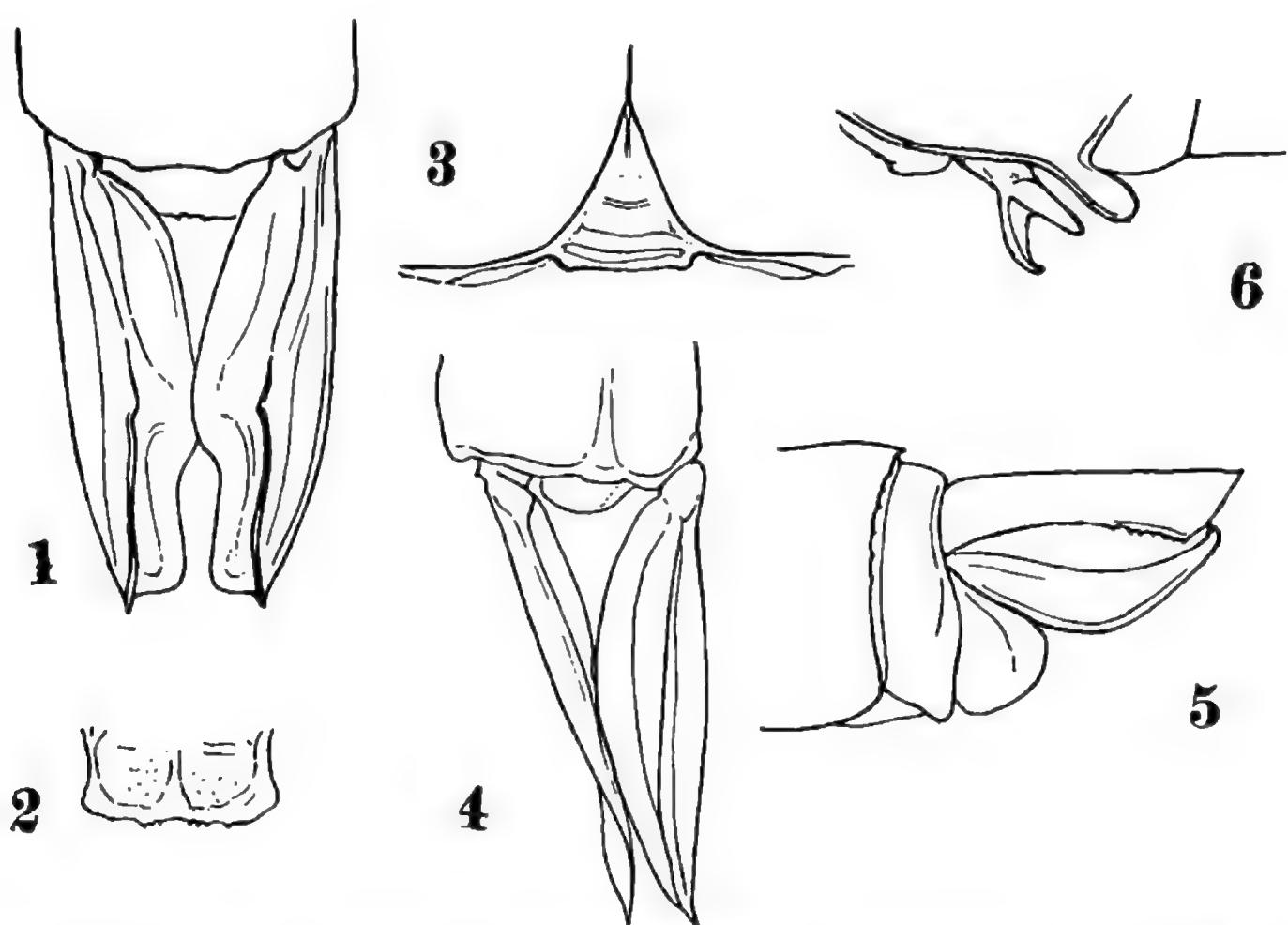
1♂ (head missing) Taiwara, 5. VIII. 1955, Leg. UMESAO.

1♀ Taiwara, 5. VIII. 1955, Leg. UMESAO.

The nominate subspecies *parthenope* (SELYS, 1839) has been known to occur in the Mediterranean area covering South Europe, North Africa, Asia Minor and Kashmir; FRASER (1936, etc.) mentioned the eastern limit of its range to be the West Coast and Deccan of India.

In eastern Asia this species was replaced by the green-bodied *A. p. julius* BRAUER which is common in Japan as north as southern Hokkaido, in the continent as north as Central Manchuria, and extending southwards to Taiwan (Formosa) and Fukien, South China. But the southern limit of its distribution is rather obscured, being still unknown from the Malay Peninsula (LIEFTINCK, Handlist, 1954).

ANDER (1944) pointed out a "historical" noteworthy record of the "race *julius*" from "Bengale" made by SELYS (1883, p. 117) who said "un *julius* des montes



**Fig. 1—4.** *Anax parthenope parthenope*, Taiwara, Afghanistan 1: ♂ Caudal appendages, dorsal view. 2: ♂ Inferior appendage, ventral view. 3: ♀ Occipital triangle, dorsal view. 4: ♀ Caudal appendages, dorsal view.

**Fig. 5—6.** *Sympetrum meridionale*, Kabul, Afghanistan 5: ♂ Caudal appendages, lateral view. 6: ♂ Accessory genitalia, lateral view.

Kashia (Bengale) est de petite taille, sa membranule est peu foncée." This record has been overlooked by specialists who studied the Indian fauna. Even Dr. ANDER himself seems to be somewhat suspicious of SELYS' record (cf. ANDER, 1944, p. 2). I could not find the same specimen in the SELYS' Collection in Bruxelles Museum during my visit in 1953, but I have, before me, a female specimen of true *A. p. julius* taken by my friend Mr. M. HOASHI at Dungun, Trengganu, Malay Peninsula. This is, in the body-colouration, size of the pterostigma, frontal marking and membranule colouration, undoubtedly a *julius* BRAUER. It will be further interesting to quote SELYS' statement (1887, p. 35) "Je possède des exemplaires de l'Asie centrale qui sont intermédiaires entre les deux formes."

In 1955 BUCHHOLZ separated two geographical races, *jordansi* (South Greece and Asia Minor) and *greyi* (Spain and North Africa) from the *parthenope parthenope* stock found in the Mediterranean area. The present material from Afghanistan does not coincide with any of them, but rather falls within the category of the nominate subspecies *parthenope* SELYS. The structure of male caudal appendages and the female occipital triangle and caudal appendage are figured here (Figs. 1-4).

### Family LIBELLULIDAE

#### 3. *Sympetrum meridionale* (SELYS, 1841)

1♂ 1♀ Kabul, 2. VII. 1955, leg. UMESAO.

3♂ 1♀ (damaged) Chaman, Pakistan, 3. VI. 1955

A wide ranging Mediterranean species, reaching eastward to Kashmir (FRASER, 1936, etc.), Mongolia (BARTENEV, 1919) and Amur (RIS, 1911, p. 636)! The specimens are all in poor condition, the male caudal appendages and the accessory genitalia are illustrated in Fig. 5 and 6.

### III. The Odonata taken by the members of the Wheat-Expedition to Iran in 1956

The Odonata of Iran are enumerated in Dr. SCHMIDT's elaborate work (1954). A tropical common species, *Tholymis tillarga*, is a new addition to it.

### Family AGRIONIDAE

#### 1 a. *Ischnura elegans ebneri* SCHMIDT

1♀ Shahsavar, 21. IX. 1956, leg. AZUMA.

1♂ 1♀ Passargadae, 27. VIII. 1956, leg. AZUMA.

#### 1 b. *Ischnura elegans pontica* SCHMIDT

1♀ Resht, 19. IX. 1956, leg. AZUMA.

2. *Ischnura* sp.

1♀ Resht, 19. IX. 1956, leg. AZUMA.

## Family LIBELLULIDAE

3. *Orthetrum sabina* (DRURY, 1773)

2♂ Resht, 19. IX. 1956, leg. AZUMA.

1♂ Tchalus, 25. IX. 1956, leg. AZUMA.

All the specimens are fully matured and extensively darkened.

4. *Orthetrum brunneum brunneum* (FONSCOLOMBE, 1837)

2♂ Shuruh, 8. VIII. 1956. leg. AZUMA. "Taken in a grass zone along an irrigation ditch of the desert".

This species is distributing from Mediterranean area as far east as Jehol, North China. Like the specimens from Kashmir these are also very small in size (hind-wing 28 mm).

5. *Crocothemis servilia* (DRURY, 1773)

1♀ Resht, 19. IX. 1956, leg. AZUMA.

A small specimen measuring the hind-wing length 26 mm with a narrow antehumeral pale stripe.

6. *Sympetrum fonscolombei* (SELYS, 1849)

1♂ Tchalus, 24. IX. 1956, leg. AZUMA.

A widely ranging species extending from North Africa to North China.

7. *Sympetrum meridionale* (SELYS, 1841)

1♂ 1♀ Resht, 19. IX. 1956, leg. AZUMA.

8. *Tholymis tillarga* (FABRICIUS, 1798)

1♂ 1♀ Passargadae, 27. VIII. 1956, leg. AZUMA.

1♂ Tchalus, 24. IX. 1956, leg. AZUMA.

This species has not been known from Iran. Is this an emigrant from south?

## IV. The Odonata taken in Western Pakistan in 1957

The Odonata of Pakistan, together with those from Kashmir, are treated in FRASER's Fauna of British India, Odonata, three volumes (1933-1936).

## Family LIBELLULIDAE

1. *Orthetrum japonicum internum* MACLACHLAN, 1894

1♂ (teneral) Saidu Shalif, 11. VII. 1957, leg. HACHIYA.

Probably this will be the westernmost limit of distribution for this species. Like the specimens from Northwest India the broad pterothoracic stripes are paler than that of the typical West Chinese specimens.

## 2. *Crocothemis erythraea* (BRULLÉ, 1861)

- 1♂ Saidu Shalif, 9. VII. 1958, leg. HACHIYA.  
1♀ Saidu Shalif, 10. VII. 1957, leg. IWATSUBO.

In Central Asia it is noteworthy that both *C. servilia* and *C. erythraea* are found together.

## 3. *Pantala flavescens* (FABRICIUS, 1798)

- 2♂ Saidu Shalif, 9. VII. 1957, leg. HACHIYA.

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## POSTSCRIPT:

After I sent the manuscript to the editor a very important work on Afghanistan Odonata was published:

SCHMIDT, E. 1961 : Ergebnisse der Deutschen Afghanistan-Expedition 1956 der Landessammlungen für Naturkunde Karlsruhe sowie der Expeditionen J. KLAPPERICH, Bonn 1952-53 und Dr. K. LINDBERG, Lund (Schweden) 1957-60. Libellen (Odonata). Beitr. f. naturk. Forsch. SW-Deutschl., 19 (3), 399-435.

In this work 61 species of the Odonata are reported.

ARTICLE III | KAWAI: PLECOPTERA



### III.

## Stoneflies (Plecoptera) from Afghanistan, Karakoram and Punjab Himalaya

(18 text-figures)

Teizi KAWAI\*

The stoneflies which were collected by the Karakoram and Hindukush Scientific Expedition of Kyoto University in 1955 and the Punjab Himalaya Scientific Expedition of the same university in 1956 are one well-preserved adult as well as a number of nymphs. Most of them were obtained at Punjab Himalaya and a few of them from Karakoram and Afghanistan. They consist of one imago which seems to be new to science and thirty nine nymphs which fell into eight genera belonging to five families. Concerning these nymphs, though specific identification must remain in question, the present author has attempted to discuss and illustrate them in detail for the purpose of adding them to our knowledge of Central Asiatic stoneflies. The stonefly fauna of the Afghanistan and Karakoram regions as well as the Punjab Himalayan region were already described by several European and American authors as follows: 6 species of imagines from Karakoram (SĀMAL, 1935), 3 genera of nymphs (species not determined) from Karakoram (VOS, 1935), 21 species from Himalaya (KIMMINS, 1946), 19 species from Central Asia (KOPONEN and BRINCK, 1949), a single species from Afghanistan (BRINCK, 1950), 2 species from Turkestan (KIMMINS, 1950), 10 species from Punjab Himalaya (JEWETT, Jr., 1958), and 20 species from Pakistan and Karakoram (AUBERT, 1969). The specimens examined by the present author are as follows;

### Perlidae

*Mesoperlina shibarica* sp. nov.

One male: the western side of Shabar Pass, Afghanistan.

*Perlodes (Skobeleva)* sp. Nymphs.

Four males: Baj Gaz Ann, Punjab Himalaya.

### Chloroperlidæ

*Chloroperla* sp. Nymphs.

Six nymphs, one male, three females and two of undetermined sex: near Gilgit, Karakoram; all specimens examined were obtained from the stomach-content of *Salmo trutta*.

\* Zoological Institute, Department of Science, Nara Women's University.

## Taeniopterygidae

*Rhabdiopteryx* sp. Nymphs.

Thirteen nymphs, sex undetermined : Valley of Phokar, Punjab Himalaya.

## Nemouridae

*Nemoura* sp. (Sp. No. 102). Nymphs.

One male and one female : Carga, Gilgit, Karakoram.

*Nemoura* sp. (Sp. No. 103). Nymphs.

Four nymphs, sex undetermined : Valley Phokar ; one nymph, Baj Gaz Ann, Punjab Himalaya.

*Amphinemura* sp. (Sp. No. 301). Nymphs.

One male and three females : the western side of Shabar Pass, Afghanistan.

## Capniidae

*Capnia* sp. 1. Nymphs.

The males : Talis (Babusal), Kashmir

*Capnia pedestris* Kimmins. Nymphs.

Two males (Babusal), Kashmir, one male, Valley of Phokar, Punjab Himalaya.

The author's grateful thanks are due to Dr. Kinji IMANISHI, Dr. Kosuke YAMASHITA and Mr. Kenji YOSHIBA, all the scientists in the Expedition, who placed the interesting materials at the author's disposal for study. The author is also indebted to Dr. Masuzo UENO, Kyoto University, who gave him facilities in various ways for this study. Thanks are also due to Dr. W. E. RICKER, Fisheries Board of Canada for valuable suggestions to this study.

## PERLODIDAE

*Mesoperlina shibarica* sp. nov. (Fig. 1)

Male : General colour yellowish green with pale brown areas particularly on head and thorax. Head yellowish with brown areas as follows : an oblong area surrounded anterior ocellus, its post-lateral angles extend backwards to anterior margin of each lateral ocellus in each narrow band, frontal area with a pair of yellowish oblong markings on near posterior margin and a narrow transverse band on occipital part ; dorsal callosities oblong, situated on a line across near frontal end of compound eye. Occipital part on middle line with a pale yellow triangular area which extends behind in a median yellow wide stripe on pronotum. Basal joint of antenna brown, outer side from second to ninth joints yellowish and inner side of them brown ; the remainings chocolate brown.

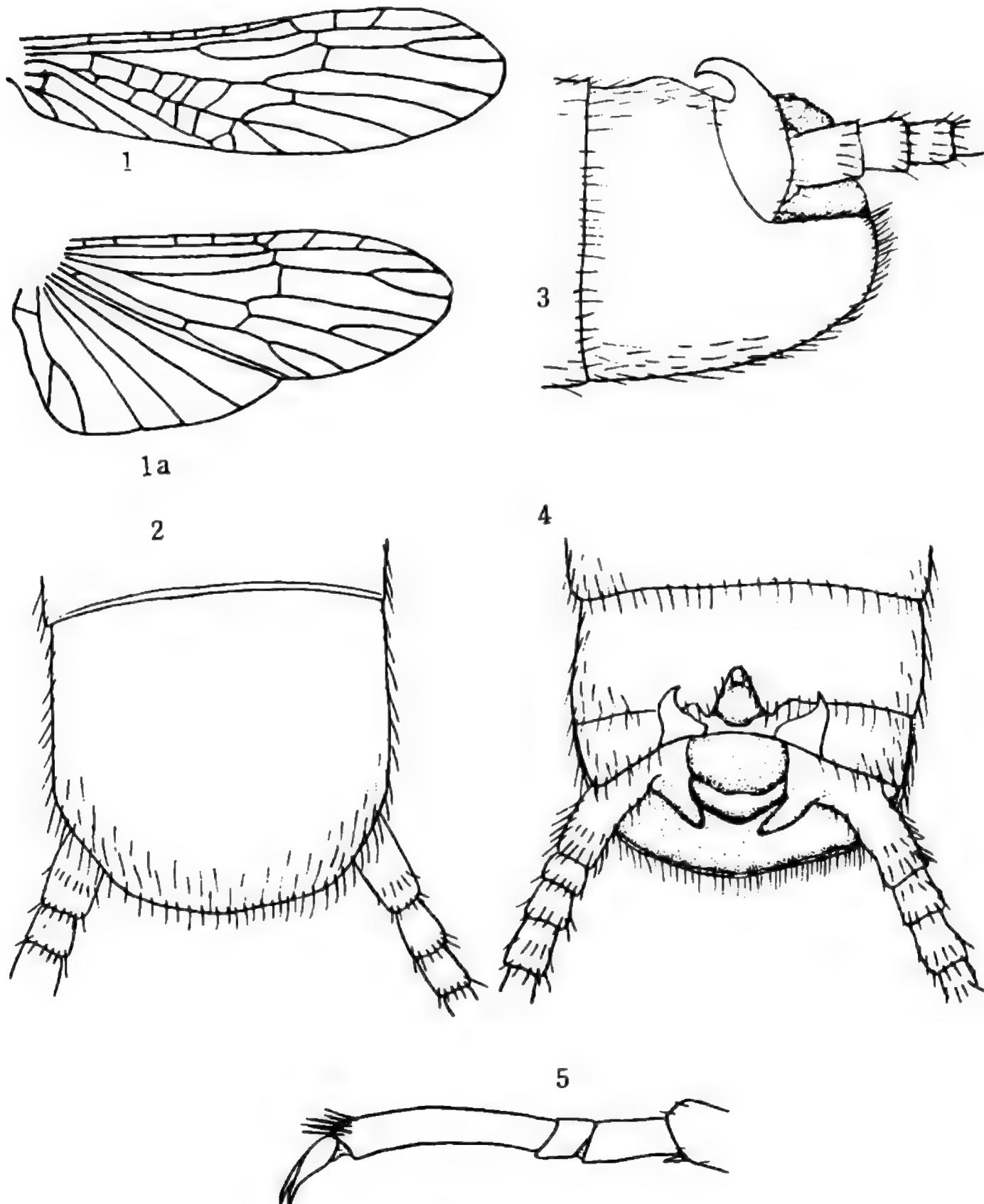
Pronotum chiefly pale brown with a median wide longitudinal yellowish stripe, width of which is narrower at middle than at both anterior and posterior ends ; dorsal surface brownish embossed irregular markings on each side ; two pairs of brown markings, one lanceolate on anterior marginal flange of each sclerite and the other crescent on near middle of posterior margin of each sclerite. Meso- and

metanotum mostly brown.

Legs yellowish, anterior side of each femur brown; tibia yellowish; basal segment of tarsus yellowish brown, distal two segments dark brown.

Abdomen chiefly yellowish green with two pale yellow longitudinal stripes on each side of median line from first to third abdominal terga; ventral side yellow. Cercus yellowish green, each joint with basal portion darker than apical.

Head wider than pronotum; with three distinct ocelli, forming a nearly equi-



**Fig. 1. *Mesoperlina shibarica* sp. nov.**

1. Right fore; 1a, right hind-wings; 2. Last abdominal segments, ventral view; 3. The same, lateral view; 4. The same, dorsal view; 5. Tarsal segments.

lateral triangular; lateral ocelli situated on a line at near middle of compound eyes; distance between them as far as between one of them and inner side of compound eye. M-line and epicranial suture indistinct. Antenna half as long as body, 5.6 mm; composed of 36 joints, basal joint wider than twice as long as second joint, followings moniliform, gradually decreasing width towards apex.

Pronotum nearly quadrate, much wider than long, angles rather rounded, pro-natal flange well developed on both anterior and posterior margins, lateral margin not developed and nearly straight. Wings long, extending well beyond the tip of abdomen and hyaline; veins brown, costal cross-veins five, subcostal cross-veins two, and Rs branched in both wings; Cu<sub>1</sub> with two accessory branches in fore-wing and only one in hind-wing; cubital cross-veins several in fore-wing, two in hind-wing, one near at base and the other near tip; M and 2A not curved, radial cross-vein situated at near radio-medial cross-veins in both wings, anal field of hind-wing with a comparatively large folded area (figs. 1: 1a).

Legs rather slender, femur and tibia of each leg slender, the former a little shorter than the latter; tarsus of each leg with three segments, basal two short, second the shortest, third the longest; third nearly one-half times as long as first and second together (fig. 1: 5).

Abdomen cylindrical, without special structures except on tenth tergum. Posterior margin of ninth tergum concave on its middle portion. Tenth tergum not cleft and reduced; on hind margin with a pair of upturned or recurved pointed brown hooks, the base of which is narrower than the diameter of basal joint of cercus (figs. 3: 4), but these hooks seem to be developed apparently from the tenth tergum: supra-anal process very small and membranous. Ninth sternum strongly produced and turned upwards over the tenth sternum, with rounded hairy margin (fig. 1: 2).

Cercus with fine hairs on distal end of each joint; about one third as long as body, 3.2 mm; composed of 11 joints; basal few joints moniliform, followings becoming longer and slender.

Female: Unknown.

Length: body 10 mm; fore-wing 9.2 mm, hind-wing 8 mm.

Locality: The western side of the Shibar Pass, Afghanistan, 24-VIII-1955, K. YAMASHITA leg.

Holotype: Male.

Remarks: This new species is closely related to *Mesoperlina nuristica* KOPONEN et BRINCK (1949, p. 21, fig. 18) which was described from Issyk-kul of Central Asia, but differs from that in the following features. The present new species is larger than *M. nuristica* whose length is 6.5 mm in the male. The M-line and cranial suture of *M. nuristica* are distinct according to KOPONEN and BRINCK's figure, but those of the present species are indistinct. The head markings of the present species are remarkable but those of *M. nuristica* are indistinct.

*Mesoperlina* is a Central Asiatic genus which is distributed in only Central Asia. This genus is placed by CLAASSEN (1940) and RICKER (1950) under the subfamily Acroneurinae of Perlidae. The external morphological features of the genus *Mesoperlina* resemble, however, more closely those of the family Perlodidae, especially the genus *Isoperla*, than those of Acroneurinae. The resemblance between these genera, *Mesoperlina* and *Isoperla*, are the colouration of the body, the wing venations and the genital parts of the male. But the former genus is distinguishable from the latter in the presence or absence of a small rounded knob on the eighth sternum of the male and the situation of the radial and radio-medial cross-veins. The supra-anal process and hooks are developed apparently from the tenth in *Mesoperlina*; these characters are different from Acroneurinae, in which they are developed directly from the subanal lobes. The venational character of the genus *Mesoperlina* does not indicate that of the Acroneurinae. The colouration of the body and wing venation of *Mesoperlina* are closely related to those of the genus *Isoperla*. But the former differs from the latter in the following characters. The radial cross veins of both the wings are situated at near the radio-medial cross-vein in the former genus, while the radial cross-vein is situated before or prolongation of the radio-medial cross-vein in the latter genus.

These structures stated above are those of the isoperlid stoneflies, not those of the acroneurid stoneflies. It seems to be desirable to the present author to erect any other family for this genus, rather than to place it in the family Perlidae.

Therefore, the author has come conclusion that it should be placed under the subfamily Isoperlineae of Perlodidae.

#### *Perlodes (Skobeleva)* sp. Nymphs. (Figs. 2 & 3)

Four nymphs were available. Body length of the largest specimen 10.3 mm, cercus 5.5 mm. General colour yellowish brown with yellowish variable markings on dorsal side, abdomen darker than other parts, ventral side milky yellow.

Head wide and somewhat flattened, wider than pronotum, M-line very distinct, yellow, dorsal callosities and anterior margin of front pale yellow. A distinct oval yellow spot located on between posterior two ocelli; two pairs of yellow spots situated on posterior part of head. With three distinct ocelli, posterior two larger than anterior one which is rounded in form; between posterior two nearly as far as between posterior one and inner margin of compound eye (fig. 2:1). Antenna long, yellow, somewhat filiform, longer than half of length of body, 6 mm.

Mouth parts are typical to those of the family Perlodidae as shown on the fig. 3. Labrum (fig. 3:1) subquadrate, a little more than twice as wide as long, anterior margin a little convex as middle, fringed with a row of minute sepia brown setae. Maxilla (fig. 3:3) well developed, yellow, distal part of lacinia brown; lacinia long and broad, pointed at tip with a large strong tooth and a small strong tooth on inner side near tip, the followings with a fringe of hairs; galea shorter than lacinia, not extend beyond the tip of lacinia, with a few minute sharp pointed

setae at tip (fig. 3:3 a); maxillary palp long and slender, with five joints, basal three broad compared with distal two which are long and slender, ratio of their lengths from base to tip as follows; 1:2:2.5:3:2. Labium (fig. 3:2) milky

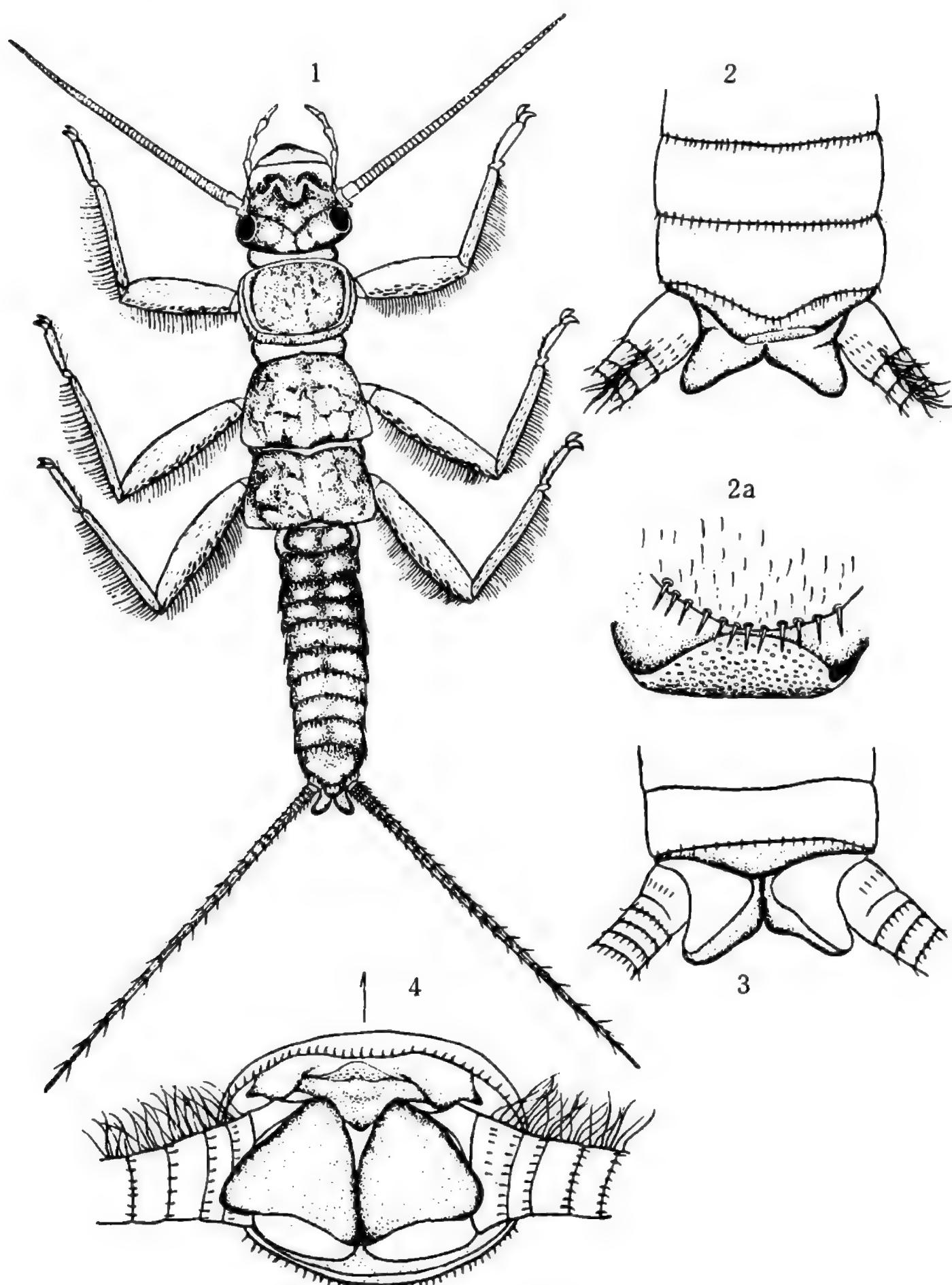


Fig. 2. *Perlodes (Skobeleva) sp., Nymph.*

1. Dorsal view of nymph; 2. Last abdominal segments, dorsal view; 2 a. membranous process from the last tergum; 3. The same, ventral view; 4. The same, from behind.

yellow, well developed; paraglossa large, semi-circular (sickle-shaped) with fringe of white fine hairs and many papilla-like processes on tip (fig. 3 : 2 a); glossa very reduced, attached to base of paraglossa; hypopharynx with rounded margin which is fringed with a group of minute sepia brown setae on anterior margin; submentum quadrate, a little broader behind, with small white finger-like gills at both outer

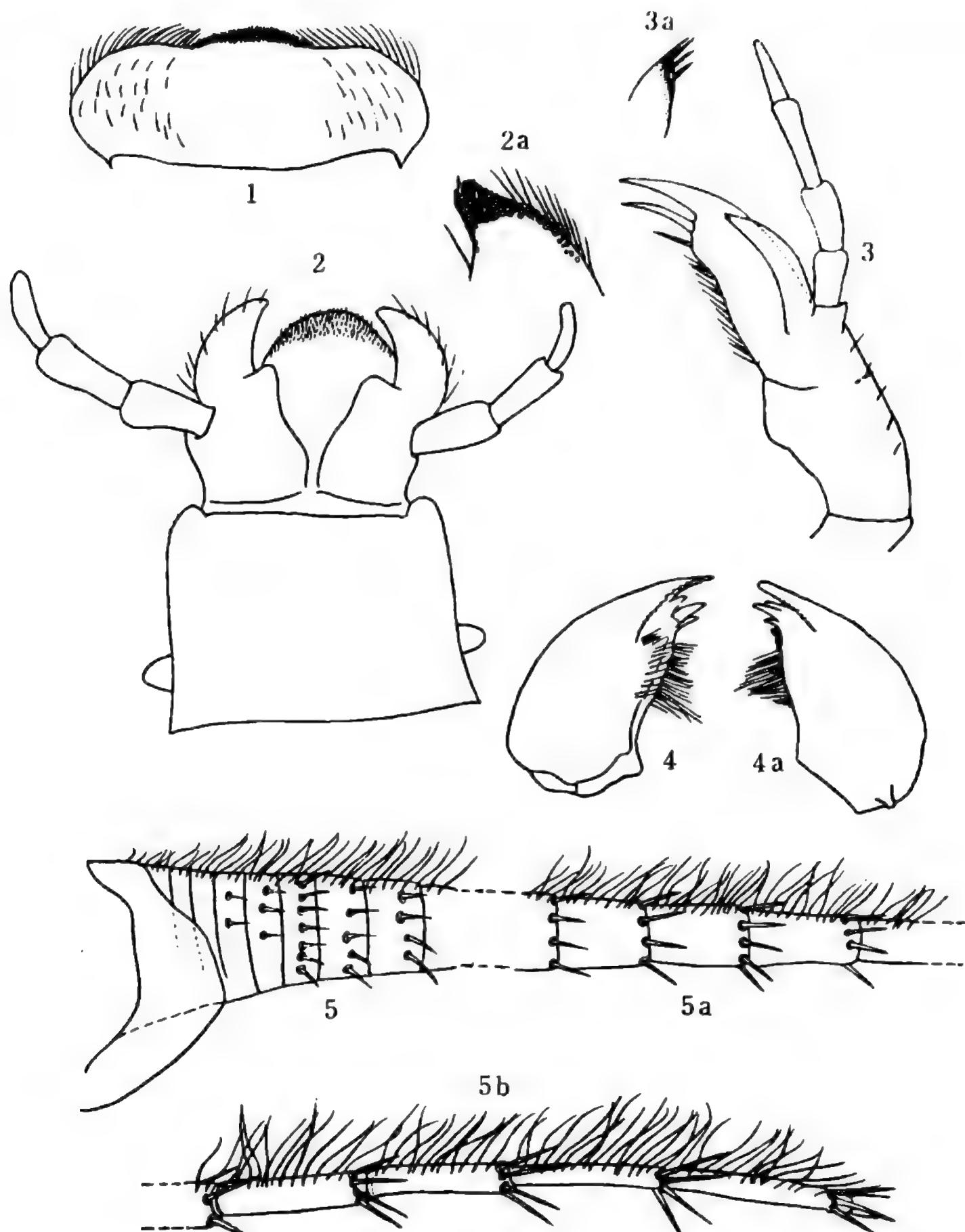


Fig. 3. *Perlodes (Skobeleva)* sp., Nymph.

1. Labrum; 2. Labium; 2 a, tip of paraglossa; 3. Maxilla; 3 a, tip of galea; 4. Left mandible; 4 a, right mandible; 5. Proximal; 5 a middle; distal parts of cercus.

posterior corners; labial palp slender, with three joints, basal one wider than distal two; first joint nearly as long as second which is longer than third; ratio of their lengths from base to tip: 1:1:0.8. Mandible (figs. 3:4, 4a) large, well developed, and strongly chitinized, with a few unequal teeth on masticatory surface, followed by two series of combs of stout hairs.

Pronotum subquadrate, wider than long, all angles somewhat rounded. General colour yellowish brown with irregular markings on dorsum, marginal flange well developed, narrow on frontal and both lateral sides only, margins without bristles, but membranous part of posterior margin scattered with many small bristles. Meso- and metanotum with some pairs of yellow markings. Wing-pads not developed in all the specimens examined.

Legs rather slender, pale yellow. Each femur long and somewhat flattened, covered with brown hairs, fringed with a row of white fine hairs on dorsal side and with a serial group of small sepia brown bristles along the dorsal margin. Each tibia long and slender, covered with brown small hairs and fringed with a series of white fine hairs on dorsal side. Tarsus of each leg with three segments; first and second very short, near equal in length, third longer than first and second together and fringed with a row of white hairs on dorsal side. Tarsal claw strong and pointed at tip which is brown in colour.

Abdomen cylindrical, brown above, darker in distal half, milky yellow below. Two indistinct yellow spots which are more distinct towards distal segments are present on each tergum and fused with both spots on last segment (fig. 2:1). First three terga completely separated from sterna, the remainings not separated. First tergum very small and sternum completely fused with basisternum of metathorax. Each tergum has a fringe of small bristles on its hind margin. Each subanal plate heavily chitinized in ventral side and membranous process from each plate extends backwards and a little obliquely upwards (figs. 2:2, 3, 4). A membranous broad process extends backwards and directed upwards from last tergum and many grain-like small processes scattered on back of its apex (fig. 2:2a). Cercus pale yellow, nearly half as long as body. Each joint has an apical whorl of stout sepia brown bristles on hind margin and a fringe of white hairs on dorsal side (figs. 3:5, 5a, 5b).

Locality: A small stream of turbid water at a temperature of 4°C by Baj Gaz Ann (ca. 4,000 m a.s.l.), Punjab Himalaya, 12-IX-1956, K. YOSHIBA leg.

Remarks: Six species (all imagines) of this subgenus, *Perlodes* (*Skobeleva*) *kuenluensis* SÄMAL, *P. (S.) apicalis* KIMMINS, *P. (S.) nuristica* BRINCK, *P. (S.) olgae* McLACHLAN, *P. (S.) cachemirica* AUBERT and *P. (S.) amabilis* JEWETT were recorded from Central Asia and nymphs of them have not been reported. According to BRINCK's view (1950, 1954), however, the species ascribed to the genus *Perlodes* of Central and Eastern Asia belong to the subgenus *Skobeleva*. In these areas, no *Perlodes* s. str. is found. The nymph of this subgenus was described by VOS (1935, p. 230, fig. 2) as *Perlodes* sp. from the Karaksh River, Karakoram. But, according

to his description and figure are not complete, the author cannot find any difference between the nymphs described by VOS and by myself from Punjab Himalaya.

The general morphological features of this nymph do not differ from the Japanese perlodid *P. (s. str.) frisonana* KOHNO, but the present nymph has a fringe of hairs on the dorsal side of the cercus and the membranous process from the last tergum, while no fringe of hairs on the cercus and no membranous process are found in *P. (s. str.) frisonana*.

## CHLOROPERLIDAE

### *Chloroperla* sp. (Nymphs) (Figs. 4 & 5)

Six specimens were available, but two of them lost the tip of their abdomen, and the cerci and antennae broken off in all of them. One nymphal male and three nymphal females are distinguishable. All the specimens examined were obtained from the stomach content of *Salmo trutta* taken at Kalma, near Gilgit, Karakoram.

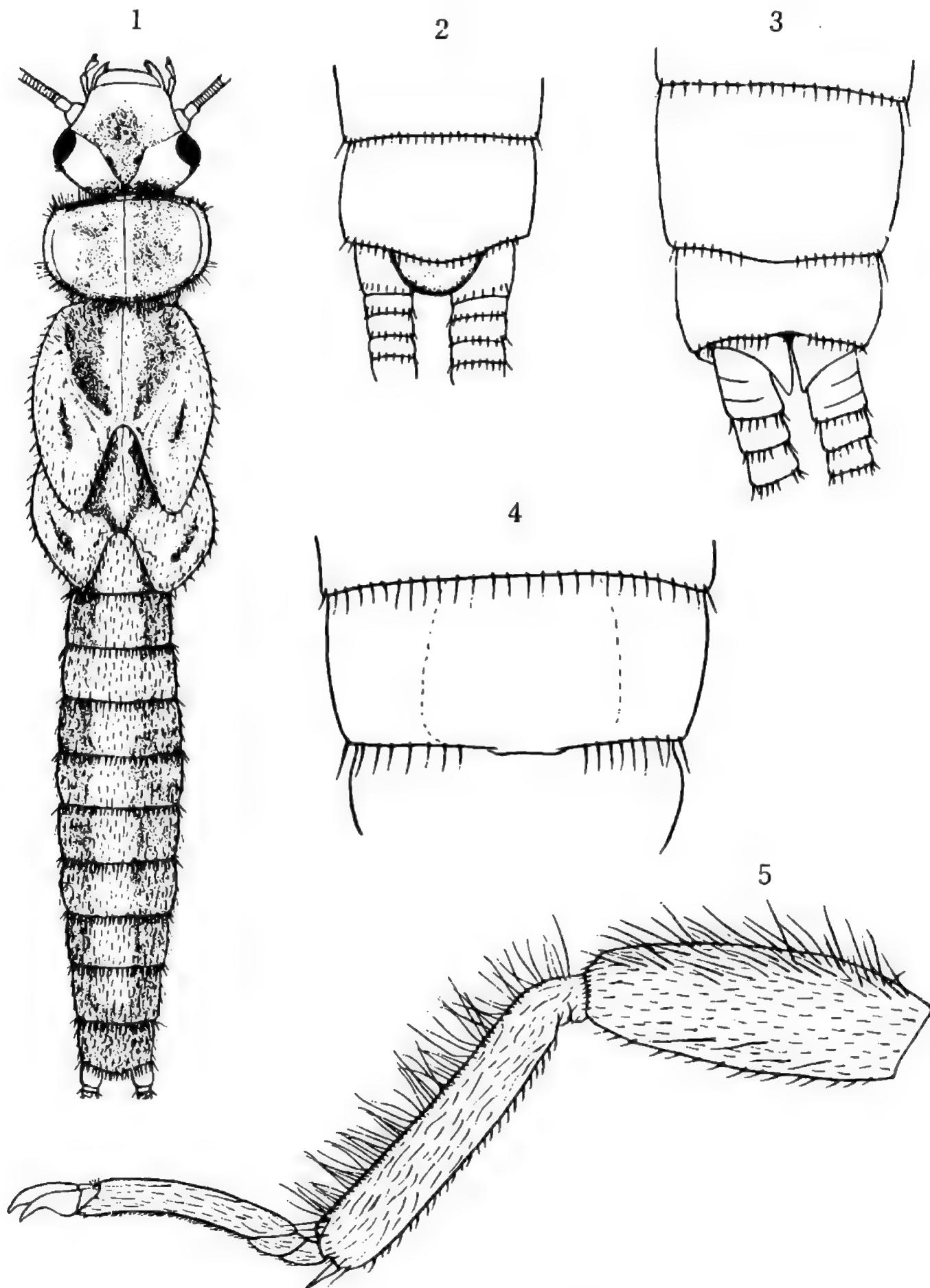
Body length 11 mm in male and 12 mm in female; general colour brown with indefinite but constant pale markings on above, yellow below.

Head slightly flattened, a little narrower than prothorax with several small bristles behind each compound eye. Posterior arm of epicranial suture very reduced, almost invisible; lateral arm of suture reaching to almost posterior margin of head. Posterior two ocelli large and oblong; anterior one very small and rounded.

Between posterior two about one-half times as far as posterior one and inner side of compound eye. Compound eye moderate in size. General colour brown; vaguely defined pale area present on front of anterior ocellus, surrounding area of anterior ocellus and the area between the behind of lateral arm of suture and posterior part of head (fig. 4:1).

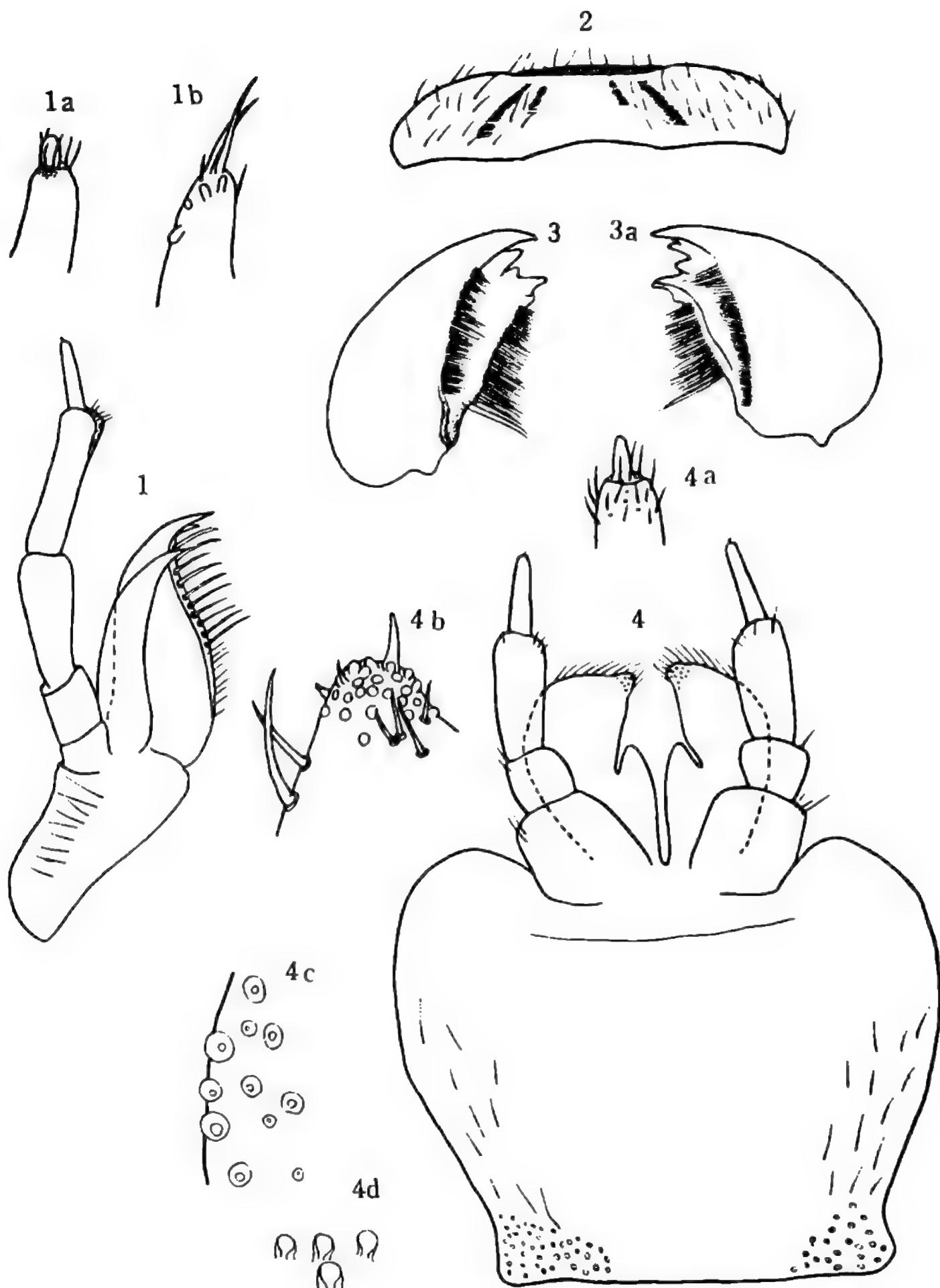
Mouth parts typical to those of the family Chloroperlidae as shown on the fig. 5. Labrum (fig. 5:2) subquadrate, nearly five times as wide as long, anterior margin a little concave, fringed with minute setae. Mandible (figs. 5:3, 3a) well developed, strongly chitinized, elongate and fairly symmetrical; masticatory surface bears two groups of a serial sharp teeth, followed by two rows of combs of stout hairs. Maxilla (fig. 5:1) well developed, lacinia long and somewhat broadly pointed tip, with a large strong tooth on inner side, followed by a fringe of stout hairs; galea elongate, shorter than lacinia, somewhat curved inwards at tip, which is produced into two small sharp bristle-like processes directed forward, in the surrounding of which there are scattered several minute processes with rounded tips (fig. 5:1 b); maxillary palp long and slender, with five joints; ratio of their lengths from base to tip as follows: 1:1.2 3:3.5:1.7; fifth joint small and very slender, width at its base nearly one third as wide as preceding joint, produced into very minute papilla-like processes at tip (fig. 5:1 a). Labium (fig. 5:4) well developed, yellow; glossa considerably reduced, attached to base of paraglossa; paraglossa large and

broad, with a fringe of hairs and papilla at tip (fig. 5:4 b) ; submentum very large, anterior corner a little projected forward ; posterior corner of both sides scattered many minute button-like processes (figs. 5:4 c, 4 d) ; mentum greatly reduced to



**Fig. 4.** *Chloroperla* sp. Nymph.

1. Dorsal view of female, exception of legs, antenna and cercus;
2. Last abdominal segments of male, dorsal view; 3. The same, ventral view; 4. Last abdominal segments of female, ventral view; 5. Fore leg.



**Fig. 5. *Chloroperla* sp. Nymph.**

1. Maxilla; 1 a, tip of maxillary palp; 1 b, tip of galea;
2. Labrum;
3. Left; 3 a, right mandibles;
4. Labium;
  - 4 a, tip of labial palp;
  - 4 b, tip of paraglossa;
  - 4 c, button-like processes of posterior corner of submentum, dorsal view;
  - 4 d, the same, lateral view.

narrow stripe; labial palp long and slender, with three joints, ratio of their lengths from base to tip as follows: 1 : 2.3 : 1.5; last joint long and very slender, with a blunt pointed seta at tip (fig. 5 : 4 a); width at its base about half as wide as preceding joint.

Pronotum subquadrate, wider than long, all angles rounded, fringed with fine hairs on anterior and posterior margins and without lateral margin; a well-defined narrow pale groove present along middle line and a pale area present on both sides of lateral margin (fig. 4 : 1). Meso- and metanotum with wing-pads, large and shield-shaped in both sexes. General colour brown with a pair of dark markings on near center of each.

Legs (fig. 4 : 5) rather slender, yellowish brown, each femur somewhat flattened and with long bristles on dorsal side; third tarsal segment of each leg nearly two and half times as long as first and second together; tarsal claw brown, very strong, pointed at tip.

Abdomen a little tapering anteriorly and posteriorly, brown above and paler brown beneath. Posterior margin of each segment with small brown bristles posteriorly. A remarkable median pale area extends from first to middle of ninth abdominal segments inclusive; subanal plate small and pointed. The sexes of the specimens examined by the author are distinguishable. In the nymphal male, ninth sternum produced a little backwards and without bristles on middle on hind margin. A ball-like membranous process extends backwards from the underside of the last tergum (figs. 4 : 2, 3). In the nymphal female, middle part of posterior margin of seventh sternum a little produced backwards and without bristles (fig. 4 : 4).

Locality: Kalma, near Gilgit, Karakoram, 29-V-1955, K. IMANISHI leg.

Remarks: The present nymphs are closely related to the British species, *Chloroperla torrentium* (PICTET) in markings on dorsal surface of the body. It can, however, be distinguished from the latter by the pronotal fringe of bristles. In the present nymphs, fringes are present only on anterior and posterior margins, while *C. torrentium* is fringed on the all margins.

Four imaginal species of this genus, namely, *Chloroperla mediata* NAVAS, *C. neglecta* ROSTOCK, *C. rosetellata* KLAPÁLEK and the present species were reported from the neighbouring regions of Central Asia and Siberia. Their nymphs, however, are not yet recorded. No records of the genus *Chloroperla* were made from Central Asia proper.

## NEMOURIDAE

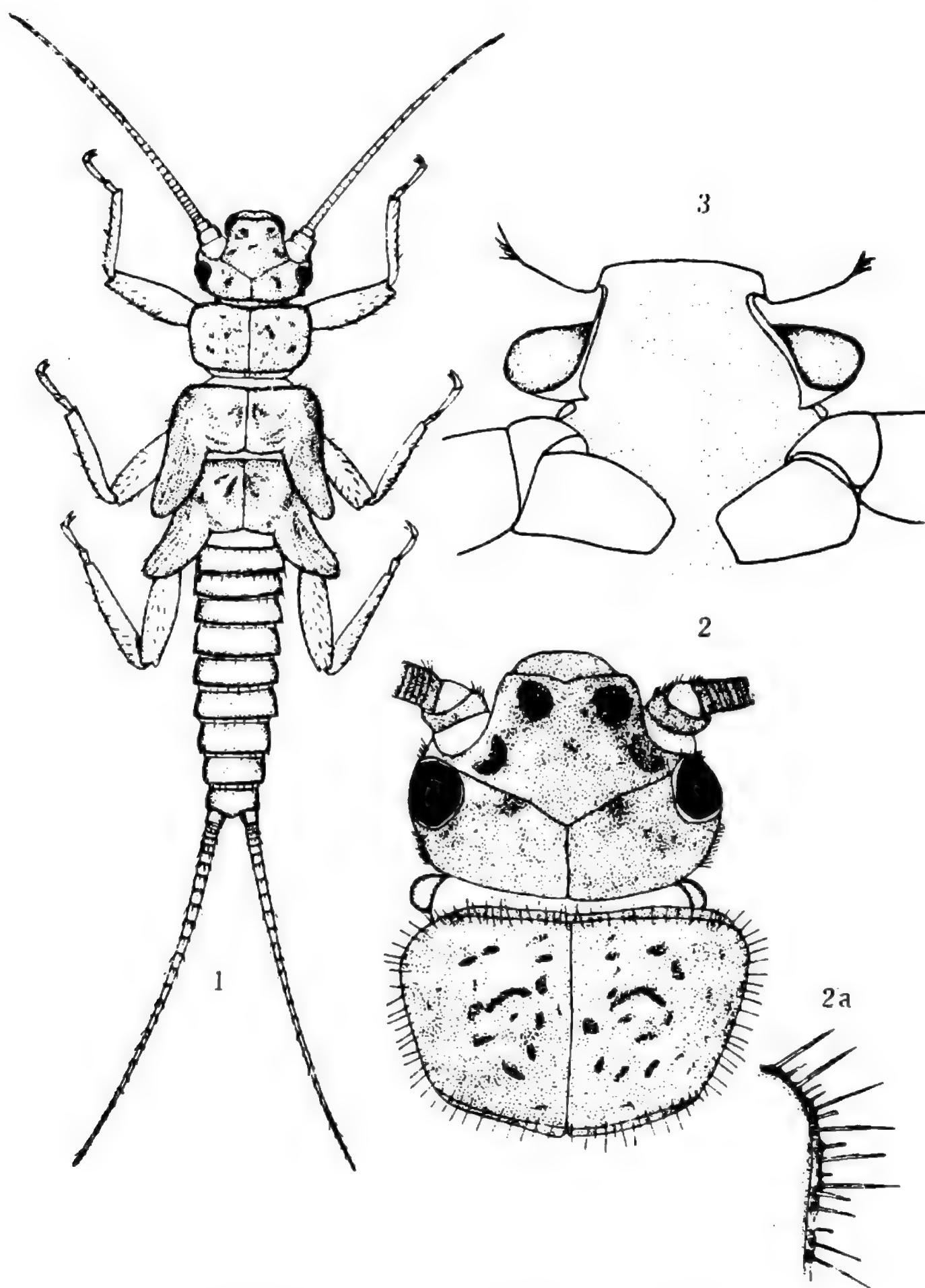
*Nemoura* sp. (Sp. No. 102), Nymphs (Figs. 6, 7, 8 & 9)

One nymphal male and one nymphal female, both of which are well grown; length of body 6.3 mm in male; 8 mm in female.

General colour brown, head darker and appendages paler than body.

Head rounded, slightly narrower than pronotum, hind margin rounded; dorsal

callosities moderate in size and more or less crescent, epicranial suture distinct, median epicranial suture three fourths as long as lateral arms of epicranial suture; epistomal suture (clypeofrontal suture) a little concave in middle portion. Ocelli indistinct



**Fig. 6:** *Nemoura* sp. (Sp. No. 102), Nymph.

1. Dorsal view of nymphal male;
2. Dorsal view of head and pronotum;
- 2 a, lateral margin of pronotum;
3. ventral view of pronotum.

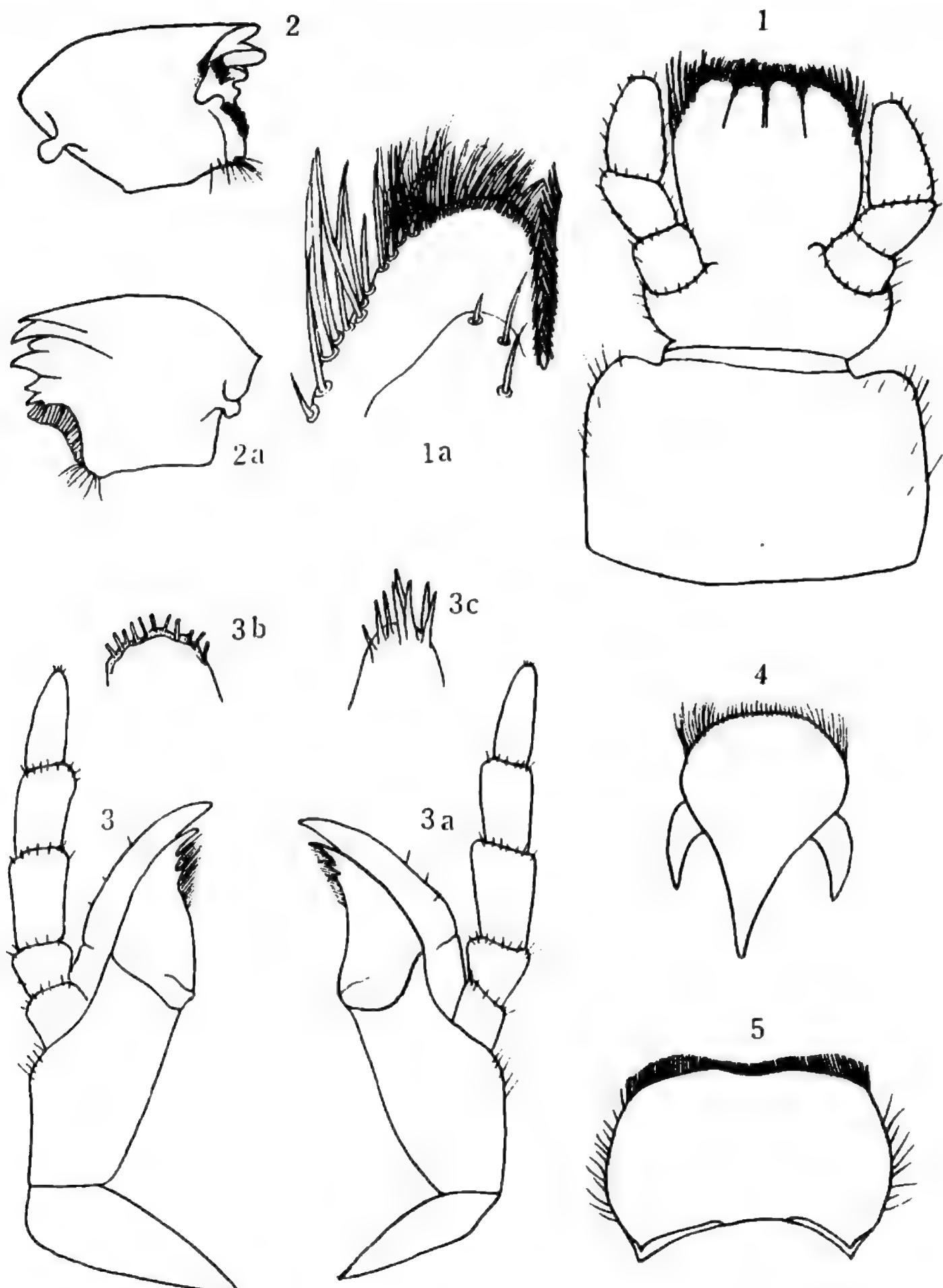
due to the same colour to the surroundings (fig. 6:2). Antenna long, filiform, half as long as body, 3.8 mm; pale yellowish, except basal two joints; basal joint wider than the other joints. A pair of rounded dark coloured marks present on antero-lateral portion of front. Postero-lateral margin of parietal sclerite with a well-developed fringe of minute bristles (fig. 6:2).

The mouth parts are typical to those of Nemouridae as shown on the fig. 7. Labrum (fig. 7:5) subquadrate, shorter than twice as wide as long; frontal margin a little concave at middle and beset with fine hairs. Mandible (figs. 7:2, 2 a) well developed, asymmetrical, with four to six unequal teeth on the masticatory surface, followed by a well-developed strong molar on the prostheca which is fringed with a comb of short hairs. Maxilla (figs. 7:3, 3 a, 3 b, 3 c) stout, distal end of lacinia with three minute teeth, followed by a fringe of hairs; end of galea extending slightly beyond the tip of lacinia and bearing at tip a minute bunch of sensory-papilla-like processes (fig. 7:3 c); maxillary palp stout, with five joints, distal three joints nearly equal, basal two joints also subequal in length, basal two shorter than distal three; tip of it with many minute sensory papillae (fig. 7:3 b). Labium (figs. 7:1, 1 a) longer than wide, submentum subquadrate and wider than long; glossa nearly as long as paraglossa, deeply cut; their distal margins fringed with fine hairs, both outer sides of paraglossa fringed with long and strong bristles, both inner and frontal margin not as outer sides (fig. 7:1 a); labial palp not extending beyond the tip of paraglossa, with last joint about as long as two proximal joints combined together, broad and ovate. Hypopharynx (fig. 7:4) rather small and not extending beyond the tip of glossa, frontal margin with fine hairs.

Pronotum quadrate (fig. 7:2), wider than long, a little windened anteriorly, all angles rounded, anterior margin a little concave, posterior margin convex, lateral margins somewhat rounded; dorsum arched, dorsal surface with a curved dark markings at the middle of both sclerites respectively, darker and smaller markings scattered irregularly; margins chocorate-brown with a well-developed fringe of small bristles of varying lengths (fig. 6:2 a). No presternal gills present on both ventral sides of presternum, but a pair of remarkably whitish gill-like membranous knobs present on both lateral sides of presternal region (fig. 6:3); Meso- and metanotum arched dorsally, with small bristles anteriorly on the former, without bristles on the latter; dorsal surface of both nota with paired markings as shown in fig. 6:1; wing-pads same colour to the nota, fore wing-pads narrower and larger than hind ones which diverge from the body.

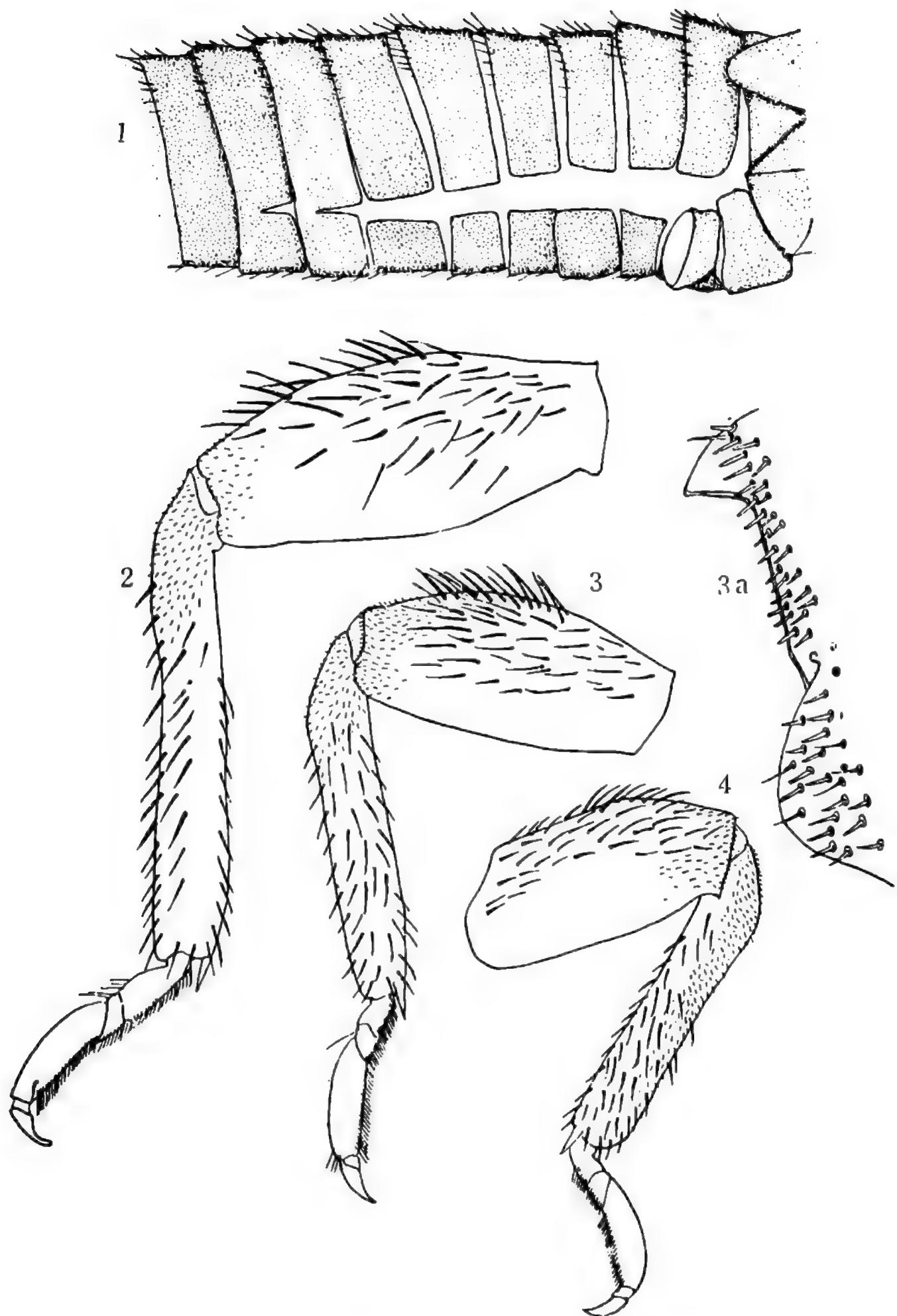
Legs stout and covered with bristles (figs. 8:2, 3, 4); femur of each leg with a group of long stout curved bristles on upper and posterior sides of their distal half, proximal half pale and with a series of many bristles, distal regions and margins fringed with a row of many bristles which have pointed tip (fig. 8:3 a); tibia with a group of small stout straight bristles on anterior and posterior sides of its distal half, and with a group of minute bristles which are pointed at tip on upper and

anterior sides of its proximal half; region with minute bristles wider in fore-leg than in other two legs (fig. 8:4). First tarsal segment of each leg shorter than third; second very short; third about as long as first and second together in hind



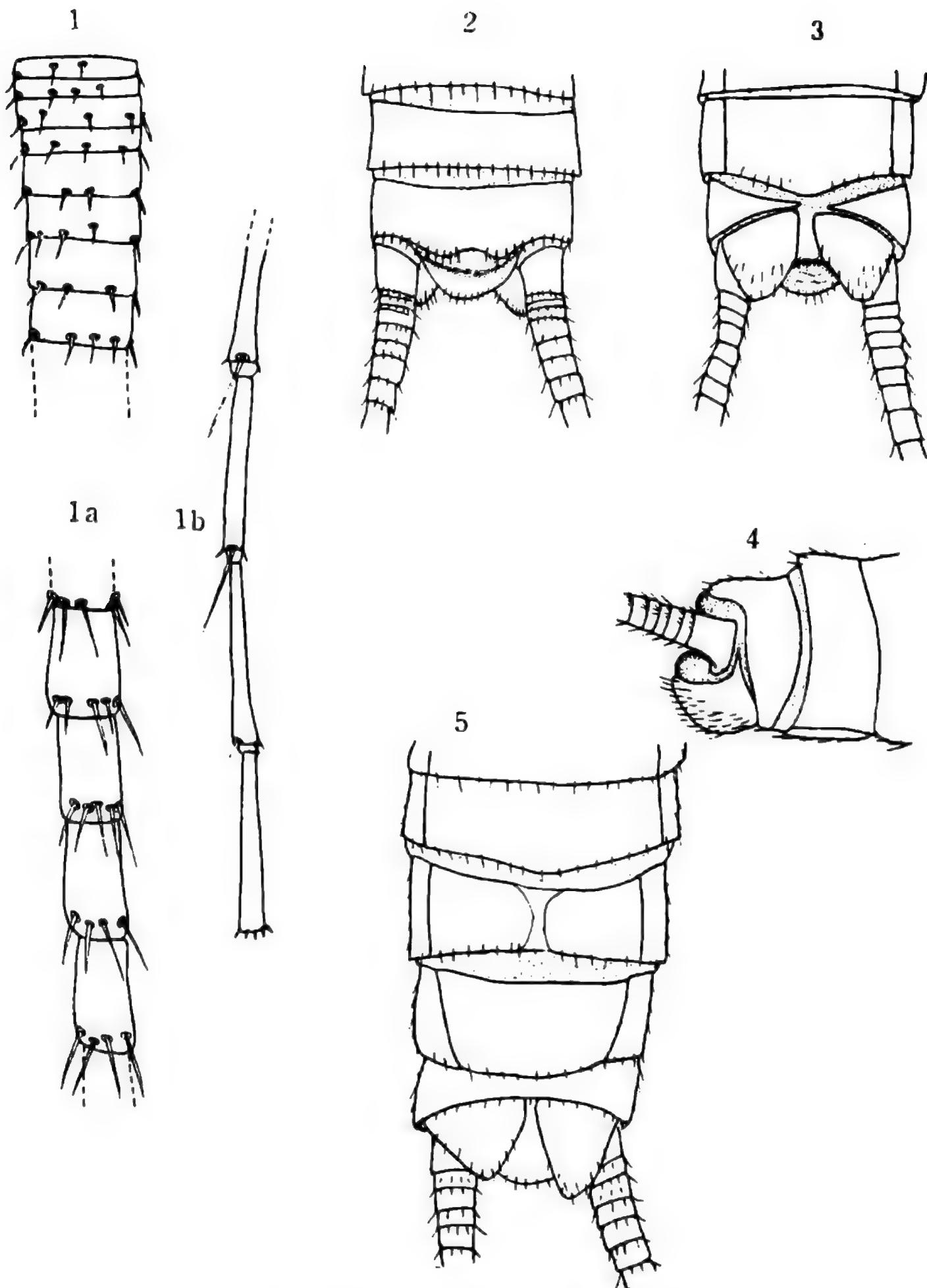
**Fig. 7.** *Nemoura* sp. (Sp. No. 102), Nymph.

1. Labium; 1 a, tip of paraglossa; 2. Left; 2 a, right mandibles;
3. Left; 3 a, right maxillae; 3 b, tip of maxillary palp; 3 c, tip of galea; 4. Hypopharynx; 5. labrum



**Fig. 8.** *Nemoura* sp. (Sp. No. 102), Nymph.

1. Lateral view of abdominal segments ;
2. Hind leg ;
3. Mid leg ;
- 3 a, distal margin of femur ;
4. Fore leg.



**Fig. 9.** *Nemoura* sp. (Sp. No. 102), Nymph.

1. Proximal; 1 a, middle; 1 b, distal parts of cercus;
2. Last abdominal segments of male, dorsal view;
3. The same, ventral view; 4. The same, lateral view;
5. Last abdominal segments of female, ventral view.

leg, but one and half as long as two segments together in other two legs; claw large and strong.

Abdomen cylindrical, brown, ventral pale brown. From first to sixth abdominal segments completely divided into tergum and sternum, seventh and eighth segments partially divided anteriorly, remaining not divided (fig. 8:1). Posterior margin of each tergum covered with hairs and has a fringe of bristles.

As pointed out HYNES (1941), the sexes of nemourid nymphs are distinguishable in the specimens over 4 to 5 mm long. The present specimens consist of both sexes (figs. 9:2, 3, 4, 5). In the nymphal male, the hind margin of the ninth sternum drawn out backwards into rounded margin (fig. 9:3), hind margin of last abdominal tergum drawn out backwards into a broadly rounded part with a little concave at its middle (fig. 9:2). In the nymphal female, the hind margin of the seventh sternum a little drawn out backwards into a wide subgenital plate; eighth sternum divided into two sclerites along median line (fig. 9:5); hind margin of last abdominal tergum drawn out backwards with broadly rounded margin.

Cercus about half as long as body length, 5 mm long, composed of 29 joints; pale brown at basal joints. Basal joints cylindrical, succeedings longer and more slender; each joint with an apical whorl of small stout dark-coloured bristles which increase in length in several distal joints (figs. 9:1, 1a, 1b).

Locality: Carga, Gilgit (the Gilgit River), Karakoram, 25-VIII-1955, K. IMANISHI leg.

Remarks: These nymphs are characterized in having a pair of remarkable large membranous gill-like knobs on both sides of the presternal region, but such knobs in Japanese nemourid nymphs are very small. A several species of *Nemoura* were recorded from Turkestan, Himalaya, and Pakistan and no nymphs of them were described.

#### *Nemoura* sp. (Sp. No. 103) Nymphs. (Fig. 10)

Five specimens were examined, but their sexes are indistinguishable, bacause all of them are smaller than 5 mm in body length. The general features closely resemble the above-described specimens, *Nemoura* sp. (Sp. No. 102), but differ from that in some features.

General colour yellowish brown or pale brown and appendages paler and abdomen darker than body.

Head rounded, nearly as wide as pronotum, hind margin rounded, dorsal callosities inditinct; epicranial suture distinct, median epicranial suture about half as long as lateral arms of suture; epistomal suture nearly straight. Ocelli indistinct due to the same colour to their surroundings. Antenna not so long, shorter than body. A large dark-coloured mark present on near the center of fron (fig. 10:1), but no markings in specimens smaller than 4.5 mm. Postero-lateral margins of head without bristles.

Pronotum quadrate, wider than long, all angles somewhat rounded, without

dark markings on dorsal side; pronotal margins with well-developed fringes of small brown bristles of nearly equal length (10:1 a), but in very small nymphs, these bristles are very minute and club-like (figs. 10:6, 6 a). No prosternal gills present

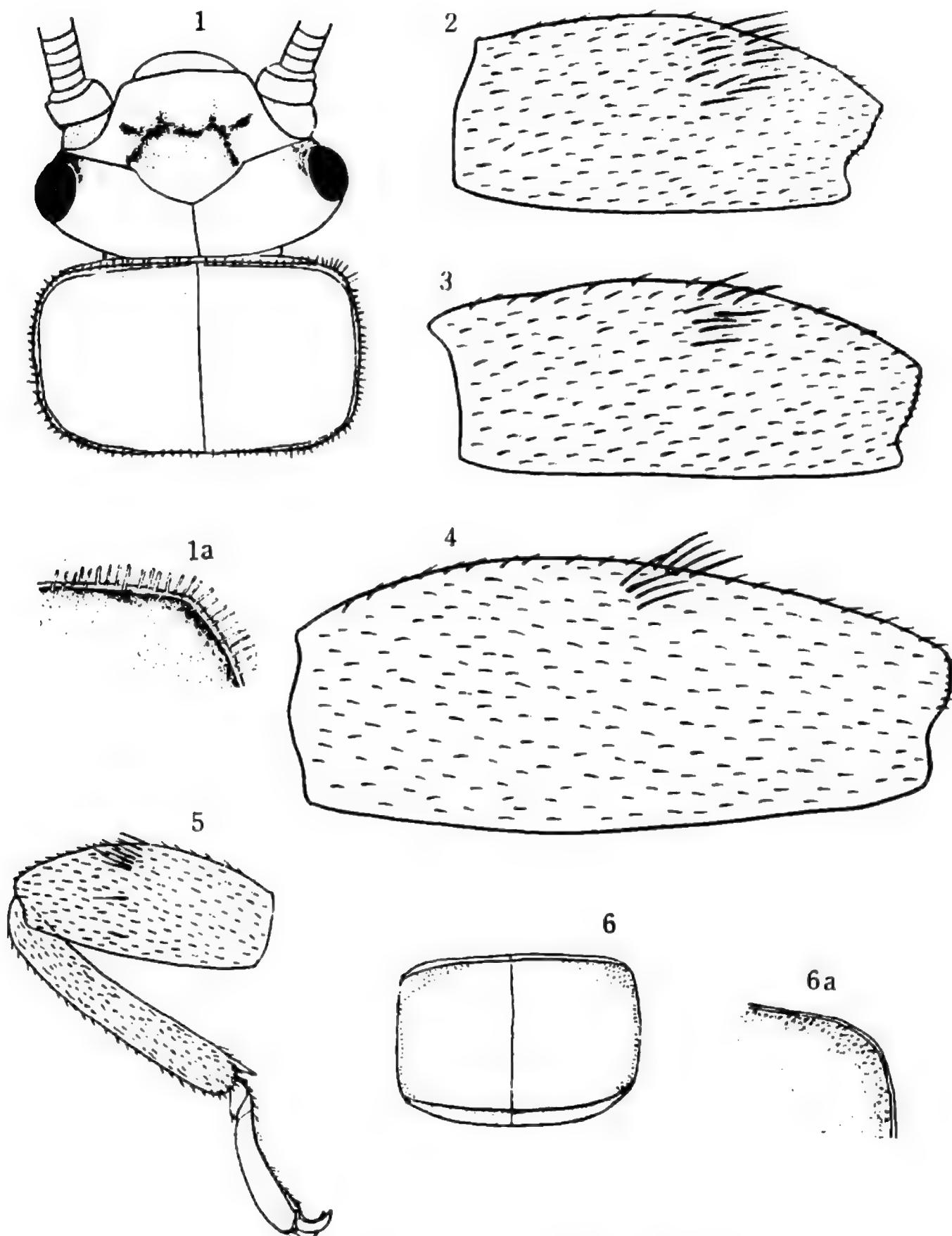


Fig. 10. *Nemoura* Sp. (sp. No. 103), Nymph.

1. Dorsal view of head and pronotum; 1a, right anterior corner of pronotum, enlarged; 2. Femur of fore leg; 3. Femur of mid leg; 4. Femur of hind leg; 5. Fore leg of younger nymph; 6. Pronotum of younger nymph, dorsal view; 6a, right anterior corner of pronotum, enlarged.

on both sides of prosternal region. Meso- and metanotum with small brown bristles anteriorly but those of the former larger than those of the latter. Wing-pads small and paler than body; each pad nearly the same size.

Legs stout and covered with small bristles (fig. 10:5); each femur (figs. 10:2, 3, 4) with a group of long stout nearly straight bristles on dorsal side of middle portion, distal end with very short bristles; each tibia darker than femur, covered with small bristles and scattered very fine hairs; third tarsal segment of each leg longer than first and second together, fringed with a row of short bristles on inner side, tarsal claw large and strong.

Abdomen cylindrical, pale brown; first to third abdominal segments divided into tergum and sternum, the remainings not divided. Each tergum fringed with small bristles on hind margin. Cercus shorter than body, 2.3 mm; basal joints somewhat cylindrical, succeedings longer and more slender, each joint with an apical whorl of stout brown bristles which increase in length towards apex.

Locality: Four nymphs; the upper part of the Phokar Valley, about 500 m down (ca. 4,300 m a.s.l.) from the end of the glacier, at water temperature 3°C, 13-IX-1956. One nymph; a small stream of turbid water at temperature 4°C, Baj Gaz Ann (ca. 4,000 m a.s.l.), Punjab Himalaya, 12-IX-1956, K. YOSHIBA leg.

Remarks: These nymphs are easily distinguishable from *Nemoura* sp. (Sp. No. 102) of Karakoram and *Nemoura* sp. (Sp. No. 101) of Japan (KAWAI, 1958) by the bristles on the femur of each leg and markings on the head.

#### ***Amphinemura* sp. (Sp. No. 301) Nymphs (Figs. 11, 12 & 13)**

One nymphal male and three nymphal females, all of which are well grown; length of body 6.2 mm in male and 7 mm in female.

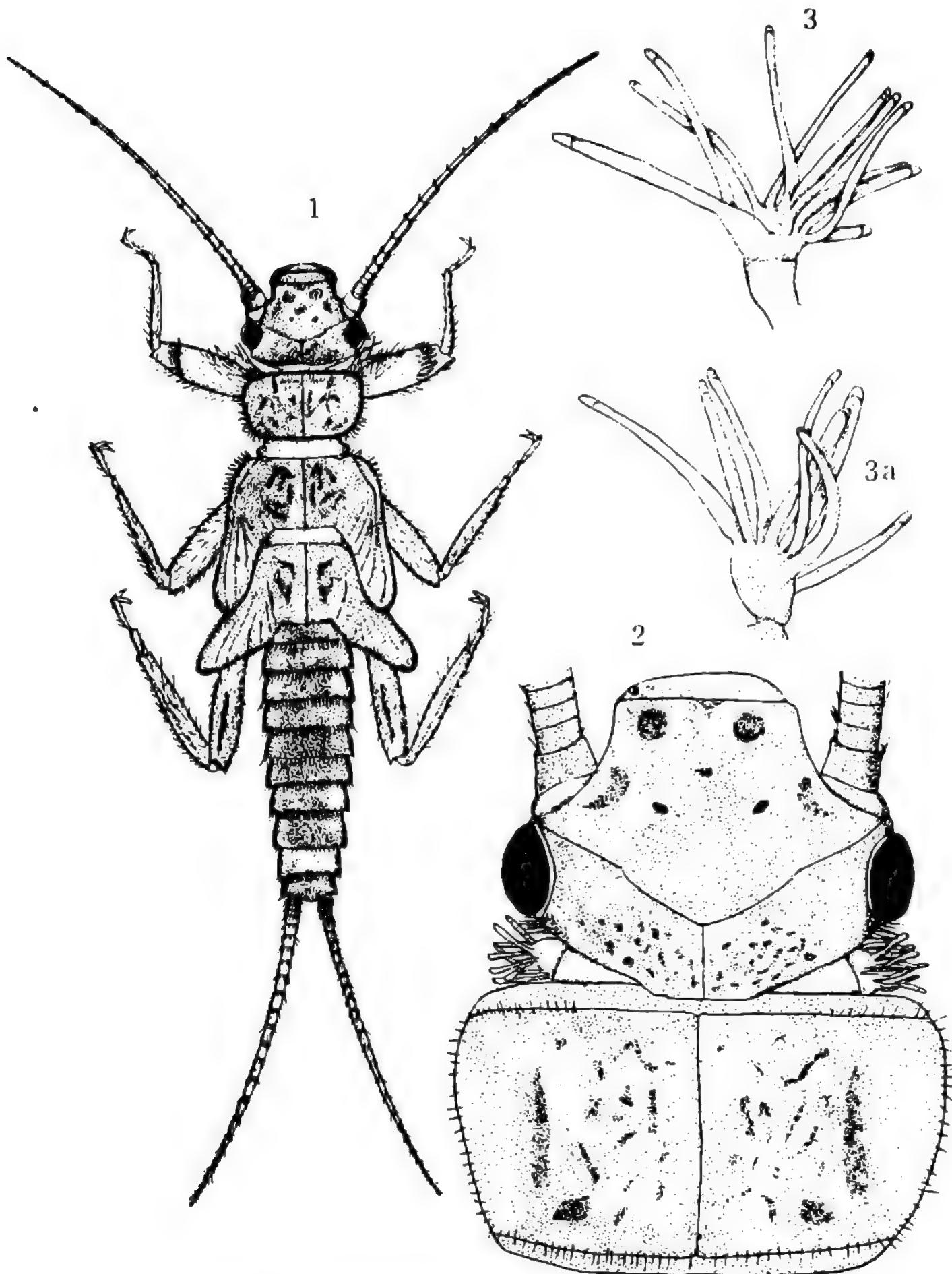
General colour dark brown, wing-pads a little lighter; colour of nymphal male paler than that of nymphal female.

Head rounded, narrower than pronotum, hind margin rounded; epicranial suture distinct, median epicranial suture two thirds as long as lateral arms of suture; dorsal callosities moderate in size; more or less crescent; epistomal suture nearly straight. Ocelli indistinct, but posterior two barely visible, very small, anterior invisible, because it is the same colour to the surroundings. Antenna long, about half as long as body, 3 mm; pale yellowish brown except brown basal two joints and distal ends; basal joint wider than other joints. A pair of dark coloured rounded markings present on the frontal margin. A pale yellowish brown subquadrate marking present on junction of median and lateral arms of epicranial suture; postero-lateral side of parietal sclerite scattered a well-developed small spots irregularly (fig. 11:2).

The mouth parts are similar to those of *Nemoura* sp. (Sp. No. 102) described above.

Pronotum quadrate, wider than long, a little narrowed posteriorly; all angles rounded; anterior margin nearly straight, posterior margin a little convex, lateral margins somewhat rounded; dorsum arched, surface with dark markings on the

middle of both sclerites scattered irregularly, usually paler on both extreme sides of lateral margin; margins with a well-developed fringe of small bristles of varying lengths, but middle part of anterior margin without bristles (fig. 11:2). Two pairs of stalked bunches of filamentous gills present on each antero-lateral side of pro-

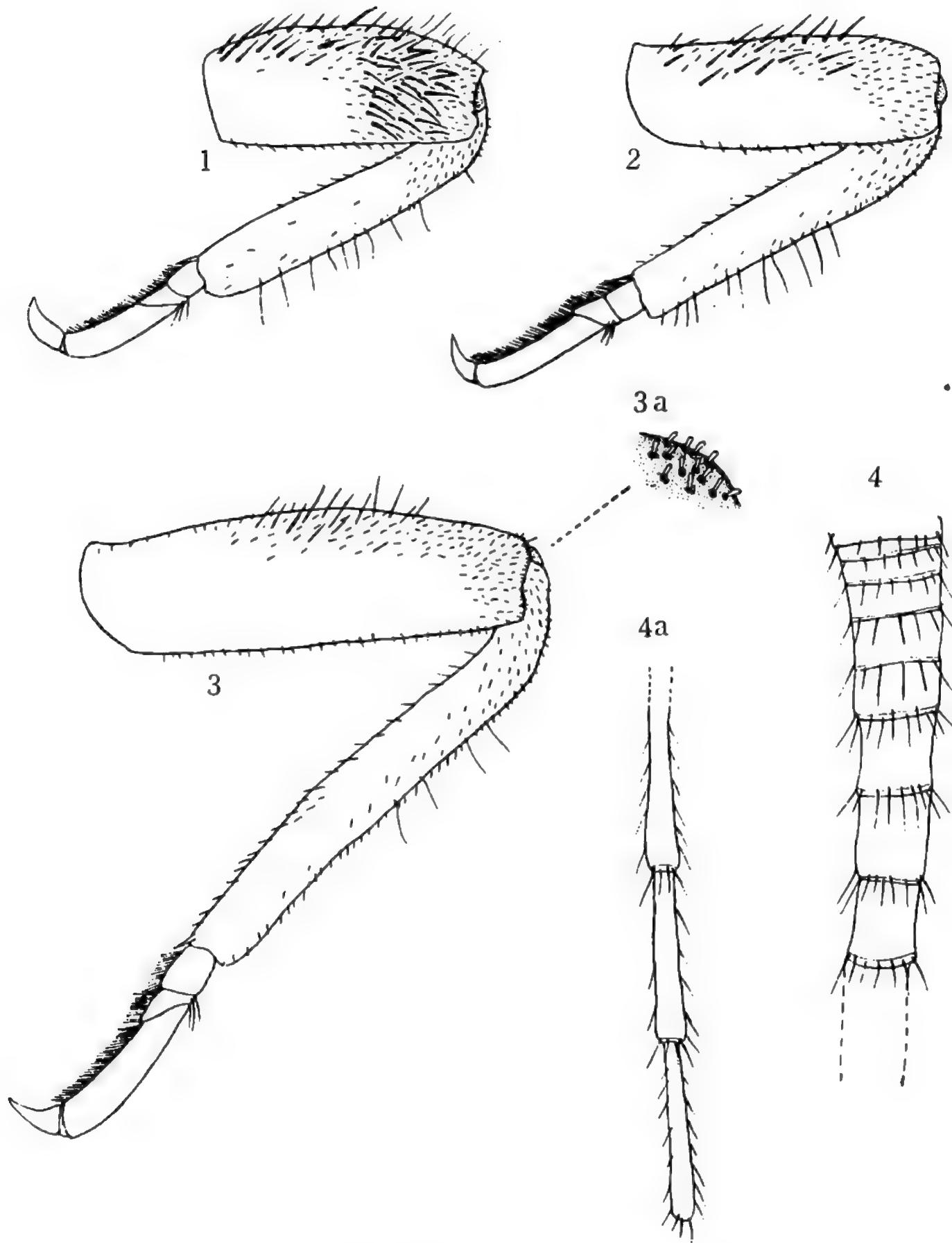


**Fig. 11.** *Amphinemura* sp. (Sp. No. 301), Nymph.

1. Dorsal view of nymphal female;
2. Dorsal view of head and pronotum;
3. Outer bunches;
- 3a, inner bunches of gill filaments.

sternum, silver white; a pair of outer bunches arise on outer side of cervical sclerite, a pair of inner one just posterior to this outer one; numbers of gill filaments on outer bunches much more than inner one (figs. 11 : 3, 3 a), in the specimens examined, 9-11 in outer and 7-8 in inner bunches.

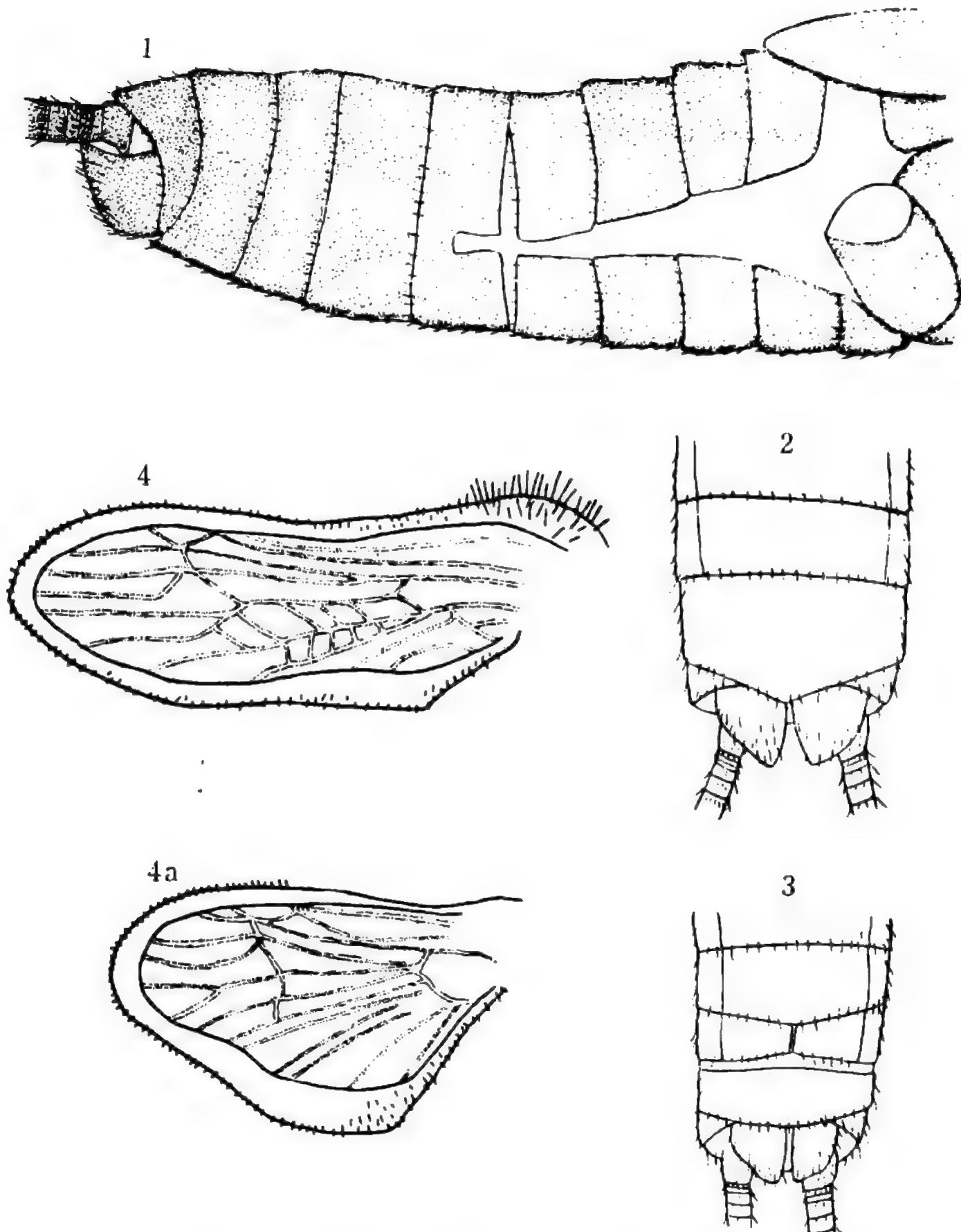
Meso- and metanotum arched dorsally, the former with small fine brown bristles



**Fig. 12.** *Amphinemura* sp. (Sp. No. 301), Nymph.

1. Fore leg ; 2. Mid leg ; 3. Hind leg ; 3 a, distal margin of femur, showing the round ended minute bristles ;
4. Proximal ; 4 a, distal part of cercus.

on antero-laterally and without on the latter (fig. 11:1). Dorsal surface along middle line through both nota with a longitudinal pale yellowish stripe in the nymphal male and without in the nymphal female; wing-pads lighter in colour than nota, fore wing-pads narrower and longer than hind ones which diverge from the



**Fig. 13. *Amphinemura* sp. (Sp. No. 301), Nymph.**

1. Abdominal segmens, lateral view; 2. Last abdominal segments of male, ventral view; 3. Last abdominal segments of female, ventral view; 4. Left fore-; 4 a, right hind-wing-pads.

body. Nymphal wings show typical venation of the genus *Amphinemura* (figs. 13-4, 4 a).

Legs stout and covered with bristles (figs. 12:1, 2, 3); femur of each leg with a group of stout bristles on posterior and dorsal sides, region with stout bristles of femur extends to anterior side on 3/4 down its length in fore leg only (fig. 12:1); distal half and margin of each femur with many well-developed minute bristles which are rounded at tip (fig. 12:3 a); tibia darker than femoral and tarsal segments of each leg; with a group of small stout rounded bristles and a fringe of a few hairs on posterior and dorsal sides; with a fringe of minute bristles which have rounded tips on proximal part. Third tarsal segment of each leg longer than first and second segments together; dorsal side of each second tarsal segment with a group of sharp stout bristles; claw large and strong.

Abdomen cylindrical, dark brown; ventral side paler than dorsal. From first to fifth abdominal segments completely divided into tergum and sternum and sixth partially divided anteriorly, followings not divided (fig. 13:1). Each tergum covered with hairs and has a fringe of small bristles posteriorly.

In the nymphal male, the hind margin of ninth sternum drawn out backwards into pointed margin (fig. 13:2); in the nymphal female, the hind margin of seventh sternum a little drawn out backwards into a wide subgenital plate with rounded margin, eighth sternum into two sclerites along middle line (fig. 13:3).

Cercus about one third as long as body, 2.4 mm; pale yellowish brown, a few basal joints cylindrical, succeedings longer and slender; distal half of each joint wider at tip than at base; distal end of each joint with an apical whorl of small bristles which do not change in length (figs. 12:4, 4 a).

**Locality:** A small clear-water stream of water temperature of 10°C in the western side of the Shabar Pass, Afghanistan, 24-VII-1955, K. IMANISHI leg.

**Ramarks:** The nymphs of *Amphinemura* was recorded by VOS (1935, p. 240, fig. 4) from the Karakash River, Kilian Kurgham, Karakoram. All the specimens examined by the present author are, however, different from them in having a group of remarkable stout bristles on the dorsal side of second tarsal segment. The description and figure given by Vos show the two remarkable long hairs on the lateral side of proximal part of the third tarsal segment and a group of small bristles on the first tarsal segment. A number of species of this genus were recorded by some authors from Central Asia, but no nymphs of them were reproted.

## TAENIOPTERYGIDAE

### *Rhabdiopteryx* sp. Nymphs (Figs. 14 & 15)

13 specimens were available; body of the largest specimen 7.5 mm and smallest one 1.6 mm; five of them have been determined their sexes, all females; eight of them sexes indistinguished.

General color pale brown, appendages yellow or greyish yellow. Head rounded, nearly as wide as pronotum, three ocelli forms nearly equilateral triangle, but anterior one very small; between posterior two nearly as far as posterior one and inner side of compound eye. Compound eye relatively small and black; situated on dorso-lateral side. In front of anterior ocellus, an U-shaped marking present. Dorsal callosities small, triangular. Many vague mottled darker markings situated on vertex. Antenna nearly as long as body, 6 mm, greyish yellow, darker in distal joints; distal margin of each joint with a small pit where lies sensillae (fig. 15:5).

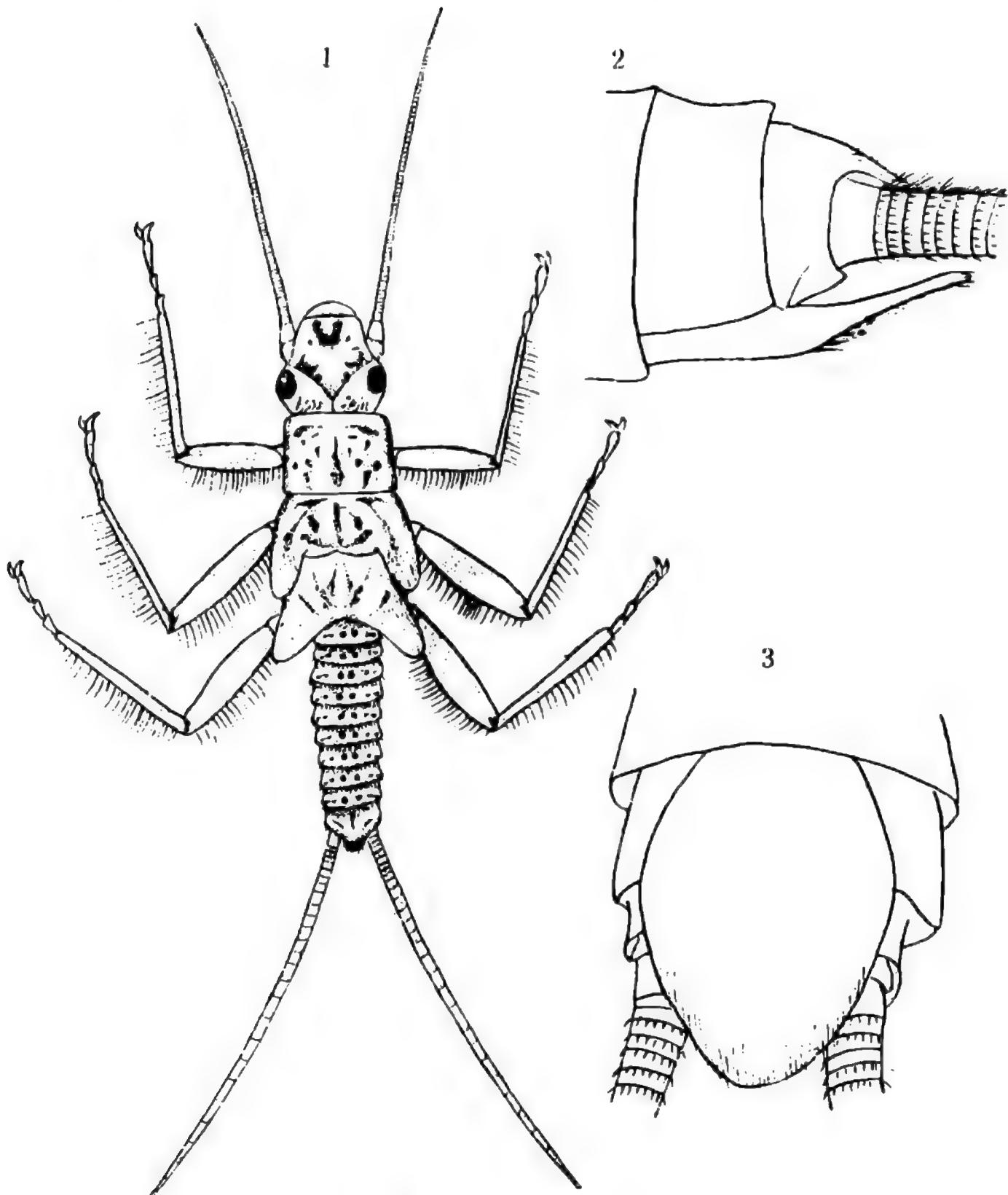


Fig. 14. *Rhabdiopteryx* sp., Nymph.

1. Dorsal view of female; 2. Last abdominal segments of female, lateral view; 3. Last abdominal segments of female, ventral view.

Mouth parts yellow, typical to those of Taeniopterygidae. Labrum (fig. 15:2) quadrate, wider than long, anterior margin a little wider than posterior; with a row of small hairs on anterior margin; two nearly parallel line of small hairs situated on near the center of labrum. Mandible (fig. 15:4) small, three teeth on masticatory surface, followed by a well-developed bristles. Maxilla (fig. 15:1) well developed, and broad; maxillary palp long and broad, with five joints, ratio of their lengths from base to tip as follows: 1:1:2:1.5:1.5, tip of last joint with many minute processes (fig. 15:1a); galea a little longer than lacinia blunt at tip, fringed with a group of bristles on inner side. Labium (figs. 15:3, 3a) large and broad; glossa and paraglossa large and nearly equal in size; paraglossa, however, a little larger and wider than glossa which is slightly pointed toward inner frontal margin; labial palp not beyond the tip of paraglossa, with three joints, ratio of their lengths from base to tip as follows: 1:2:2.5, last joint ovate.

Pronotum trapezoid, the widest behind, slightly wider than long, all angles not rounded; irregular dark markings on each side. Meso- and metanotum brown in colour, with a few pairs of paler patterns. Wing-pads paler in colour, a little diverge from the body; fore wing-pads narrower and a litte smaller than hind ones (fig. 14:1); wing venation (fig. 15:6) which shows the characteristics of the genus *Rhabdiopteryx* is visible in grown nymphs; fore wing-pads with three cross-veins between C and Sc, Sc terminating more than two thirds of the distance from the base to apex of pad; R<sub>2</sub> and R<sub>3</sub>, and R<sub>4</sub> and R<sub>5</sub> separate from each other; M<sub>1+2</sub> and M<sub>3+4</sub> divided point; Cu, branched one accessory vein only.

Legs rather slender and yellow or greyish yellow; each femur grooved anteriorly as to receive the tibia, dorsal side of femur and tibia of each leg fringed with a row of fine white hairs; each tarsus darker than other segments of leg, brown, without a fringe of hairs; first two tarsal segements subequal and as long as third; tarsal claw moderately strong, its tip blackish brown, pointed.

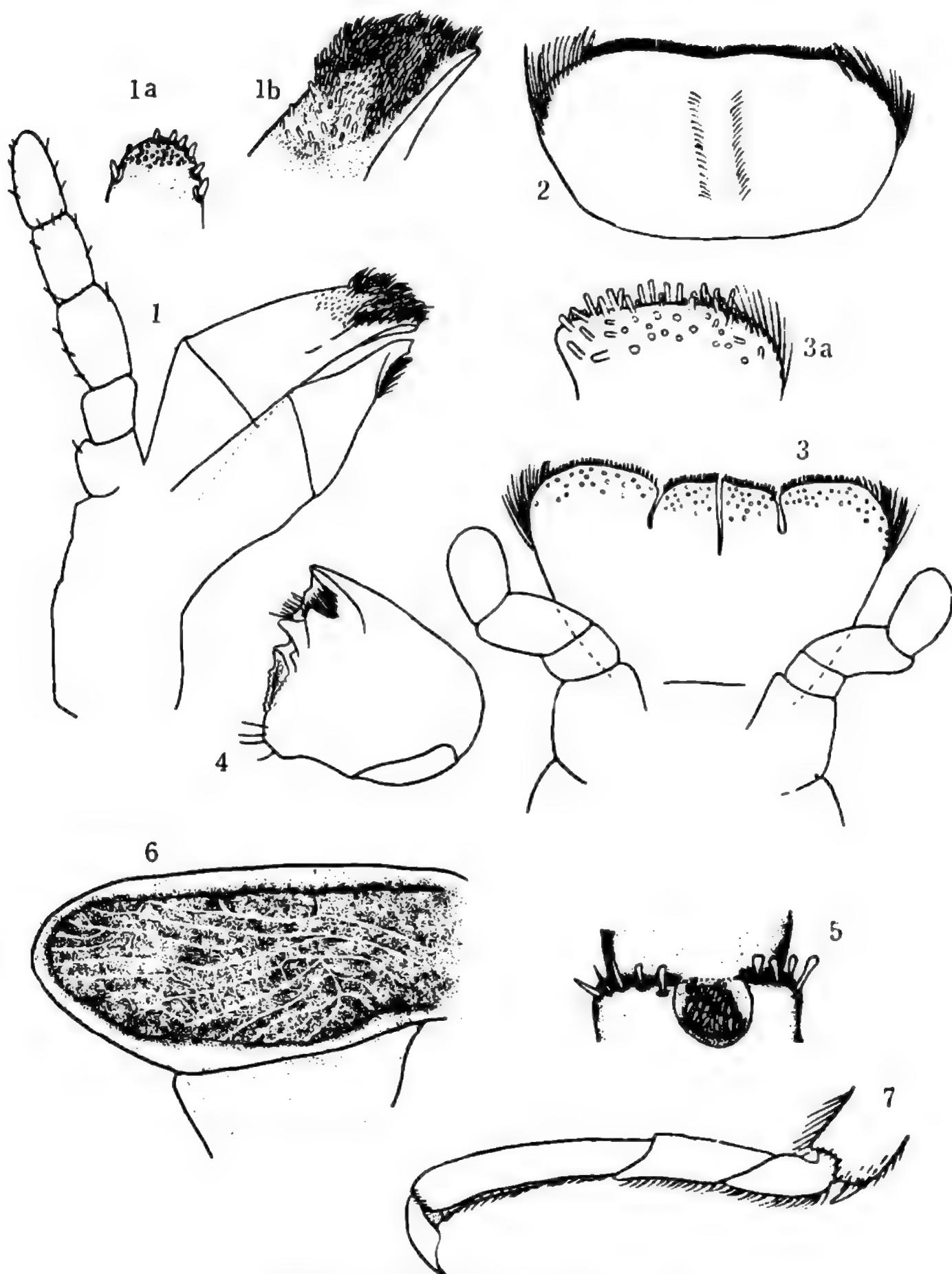
Abdomen cylindrical, first eight sterna membranous; each tergum brown but hind margin a little paler: darker spots of three pairs which are large in most of inner pairs situated on each side of middle line of near the anterior margin; covered with brown bristles on hind margin. Tenth tergum (fig. 14:2) a little produced backwards and downwards into a blunt tip; ninth sternum ovate, produced directed backwards beyond the tip of abdomen and blunt margin at the end.

Cercus long, nearly as long as body, 6.3 mm, yellow, dorsal side of base of each joint armed with small setae which decreas in length in several distal joints.

The specimens smaller than 4 mm in body length were also collected in the same locality. They resemble the large nymphs in morphological features. The small nymphs are brown in colour uniformly in dorsal and whitish brown in ventral side. In the nymphs smaller than 2 mm long, the ninth sternum is not produced into a large plate which extends beyond the last abdominal segment and their ocelli are divided into four parts. The nymphs over 4 mm long, however, the ninth sternum

is produced backwards and their ocelli are combined together the complete ocelli as in those of large nymphs.

Locality: The upper part of the Phokar Valley, about 500 m down (ca. 4,300 m



**Fig. 15. *Rhabdiopteryx* sp., Nymph.**

1. Maxilla, 1 a, tip of maxillary palp; 1 b, tip of galea;
2. Labrum;
3. Labium; 3 a, tip of glossa;
4. Right mandible;
5. Small pit of tip of each antennal joint, showing sensillae;
6. Left fore wing-pad;
7. Tarsal segments of mid leg.

a. s. l.) from the end of glacier, at water temperature 3°C, Punjab Himalaya, 13-IX-1956, K. YOSHIBA leg.

Remarks: The imagines of *Rhabdiopteryx lunata* KIMMINS were recorded from the Rongbuk Glacier, Mt. Everest base camp in 1922. The other species of this family recorded from Central Asia belong to other genera. The venation of *R. lunata* is closely related to that of the above-described nymph, but that of the latter differs from that of the former in the features of  $R_4$  and  $R_5$ , both of which are however not divided in *R. lunata* but completely divided in the present nymphs.

## CAPNIIDAE

### *Capnia* sp. 1, Nymphs (Figs. 16 & 17)

Two nymphal males; length of body 13-15 mm.

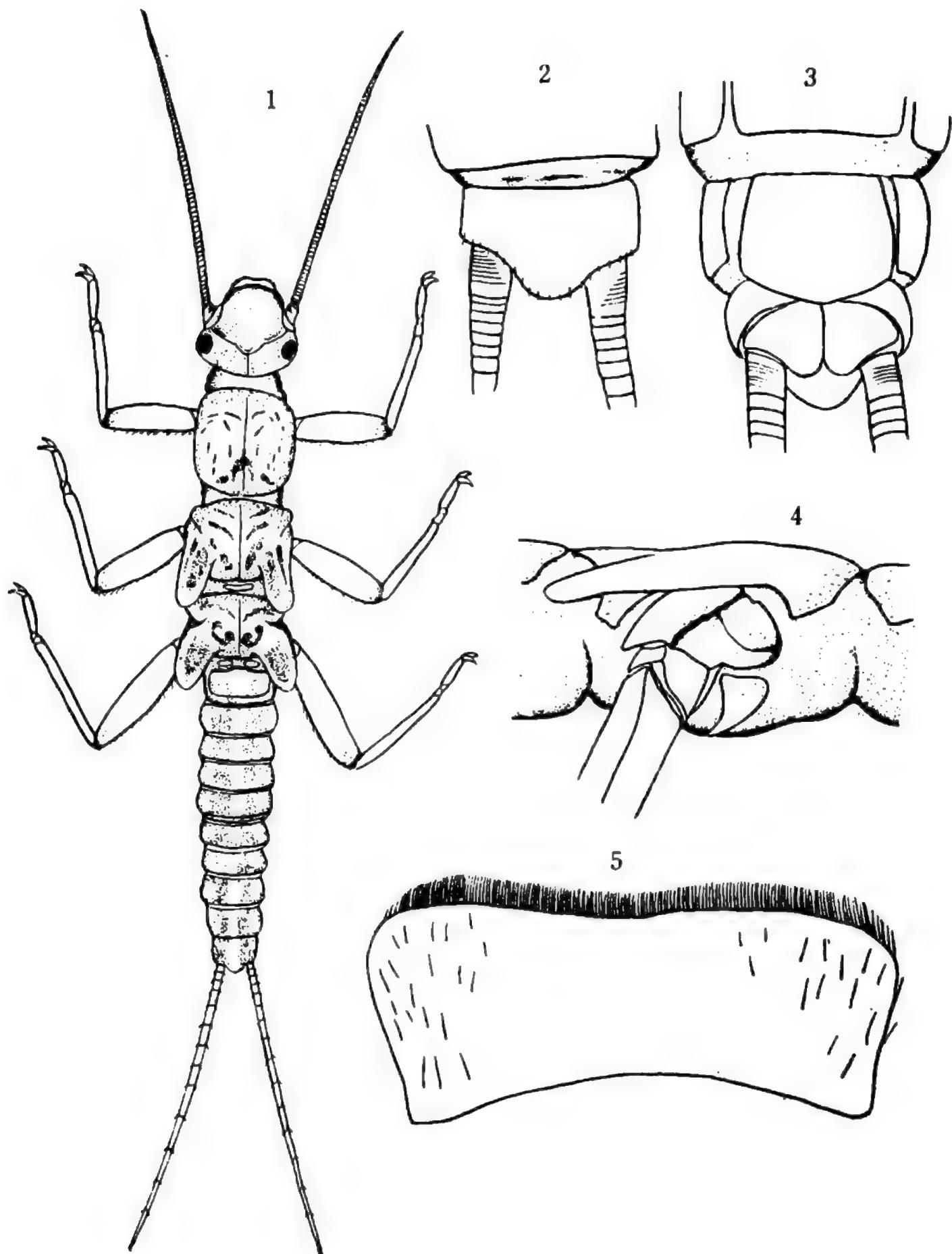
General colour brown, milky brown below, antenna and appendages and cercus pale brown.

Head rounded, a little wider than pronotum, without remarkable markings; epicranial suture very distinct. Compound eyes small and black, situated on postero-lateral side; three ocelli indistinct, but the situation which are situated them are paler than the surrounding area (fig. 16:1). Antenna slender and about half as long as body, 7 mm; bearing small spines on basal joints and decreasing in length and in size towards apex.

Mouth parts characteristic of Capniidae. Labrum (fig. 16:5) quadrate, wider than long, about three times of its length; fringed with a serial small brown hairs on anterior margin; Labium (fig. 17:2) longer than wide; glossa and paraglossa nearly subequal; glossa a little shorter than paraglossa; with a fringe of hairs on anterior margin of both glossae; labial palp not extends to the tip of paraglossa, with three joints, basal joint shorter than both second and third, both of which are subequal. Mandible (figs. 17:1, 1a) well developed, three or four teeth on masticatory surface, followed by a well-developed molar on prostheca which is fringed with a comb of short stout hairs. Maxilla (fig. 17:3) stout; maxillary palp with five joints, first the shortest, and third the longest; ratio of their lengths from base to tip as follows: 1 : 1.5 : 3.2 : 2.5 : 3; galea not extend beyond the tip of lacinia, its tip scattered with minute setae and bristles which have rounded tip (fig. 17:3a); lacinia pointed at tip, fringed with several strong bristles on inner side, followed by a serial group of hairs.

Pronotum quadrate, longer than wide, all angles rounded, fringed with serial group of brown minute bristles along pronotal margin, but those of anterior and posterior margins are denser than lateral ones; irregular markings scattered on dorsal side. Mesonotum larger than the other nota; meso- and metanotum fringed with a group of brown minute bristles and paired markings situated on dorsal side. Mesopleuron (fig. 16:4) well developed, suture between anepisternum and katepisternum is very distinct; anterior and posterior baselare a little developed, anterior one

shorter and broader than posterior one; alifer not developed; katepisternum smaller than anepisternum and completely separated from basisternum; epimeron well developed and large, fused with two main parts of mesopleuron by distinct suture.



**Fig. 16. *Capnia* sp. 1, Nymph.**

1. Dorsal view of female; 2. Last abdominal segments of male, dorsal view; 3. The same, ventral view; 4. Mesothorax, lateral view;
5. Labrum.

Wing-pads small, parallel to the body; fore wing-pads slender compared with hind ones; hind wing-pad a little diverge from the body.

Legs rather slender, covered with bristles and hairs, hind femur longer than

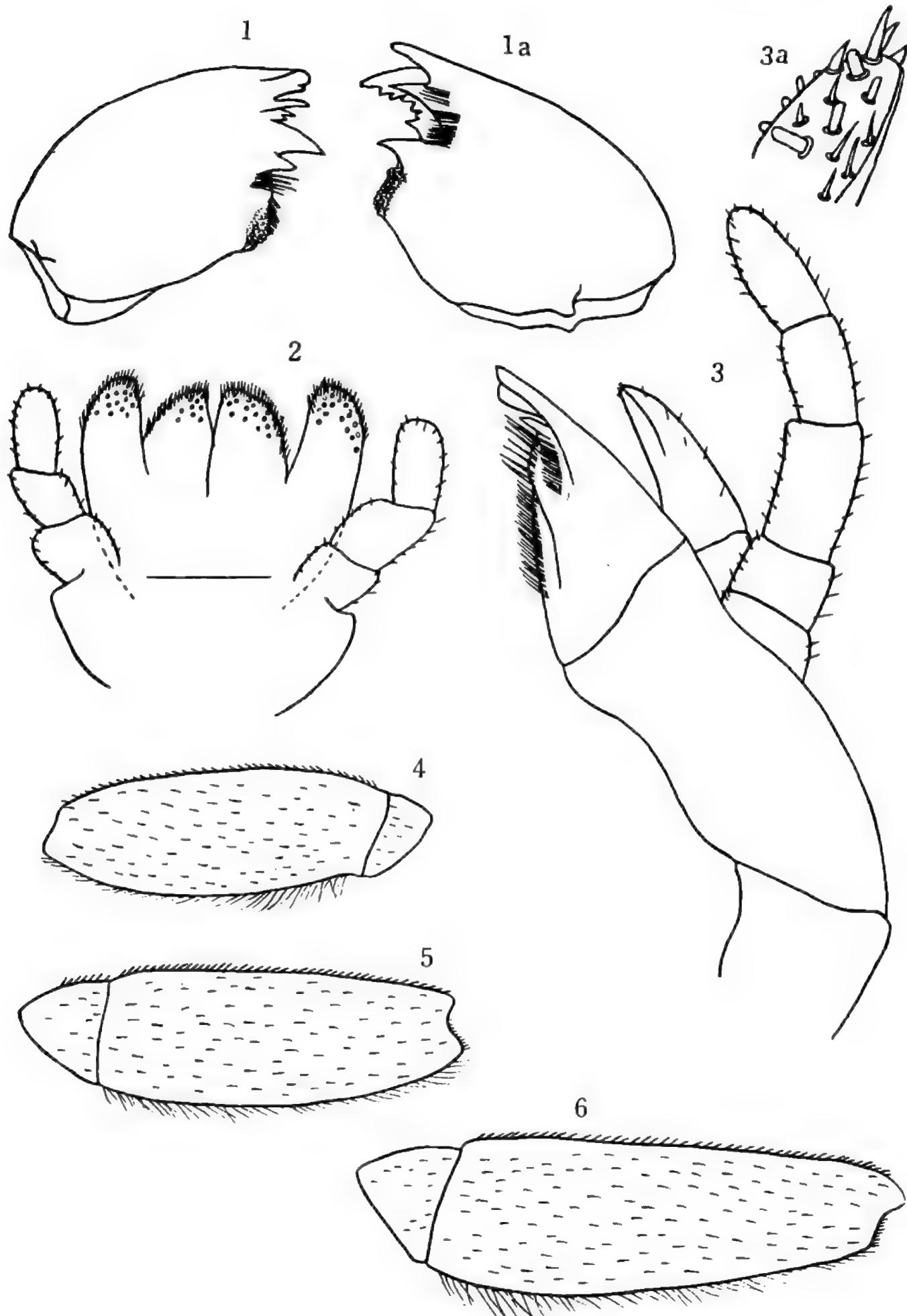


Fig. 17. *Capnia* sp. 1, Nymph.

1. Left; 1 a, right mandibles; 2. Labium;
3. Maxilla; 3 a, tip of galea; 4. Fore femur;
5. Mid femur; 6. Hind femur.

other femora; each femur (fig. 17:4, 5, 6) fringed posteriorly with fine white hairs which decrease in length towards distal end, and covered with small brown bristles on surface; each tibia long and slender, fringed with fine white hairs posteriorly, and covered with brown bristles; third tarsal segment longer than first and second together, about three times as long as other two segments.

Abdomen a little tapering posteriorly, with a little pale stripe along middle line from first to last abdominal segments and paler spots on both sides on each tergum, except on last tergum. From first to ninth abdominal segments inclusive completely divided into tergum and sternum, last sternum reduced, first tergum smaller than other terga, first sternum completely fused with basisternum of metathorax. Posterior margin of each tergum fringed with short brown bristles, no short hairs along each tergum. Tenth tergum (fig. 16:2) produced backwards into a rounded blunt hind margin; ninth sternum (fig. 16:3) wider than long, anterior margin a little narrower than posterior; posterior margin a little extends backwards. Cercus about half as long as body, 7.5 mm long; basal joints cylindrical, succeedings longer and slender; each joint with small stout darker bristles which do not change in length towards distal end.

Locality: A small shallow clear-water stream at temperature 6°C in Talis (Babusal) (ca. 3,500 m a.s.l.), Kashmir, 18-X-1956, K. YOSHIBA leg.

Remarks: More than ten species of the imaginal capniid stoneflies were recorded from Central Asia but their nymphs are quite unknown. Although a nymph of this genus was described by VOS (1935, p. 239, fig. 3) from Sanju-Pass, Tehrong and Katalik, Shyokin Karakoram, the author cannot find the difference between the present and his nymphs due to his meagre description and figure.

#### *Capnia pedestris* KIMMINS, Nymph (Fig. 18)

Three nymphal males; length of body 10 mm, one of them shorter than 5 mm long. These specimens examined by the author do not differ from *Capnia* sp. 1 described above in the general form and in morphological features. They differ, however, from *Crpnia* sp. 1 by the lack of wing-pads, the structures of the mesopleuron and the last abdominal segment.

Pronotum nearly as long as wide, all angles rounded, fringed with a serial group of minute bristles along pronotal margin, without markings on dorsal side. Meso- and metanotum resemble pronotum in form and are smaller than those of *Capnia* sp. 1, but narrowly behind, and entirely lack of wing-pads. Mesonotum larger than pro- and metanotum, pentagon, anterior margin wider than posterior, lateral margin nearly straight, without wing-pads or wing-pad-like processes. Mesopleuron (fig. 18:2) not developed compared with that of *Capnia* sp. 1; epimeron considerabl larger than the other parts of mesopeluron, and fused partially with other two parts; tip of anepisternum rounded, without anterior and posterior basalare and alifer; katepisternum completely fused with anepisternum and suture between both episterna indistinct; basisternum invisible from lateral side. Metanotum

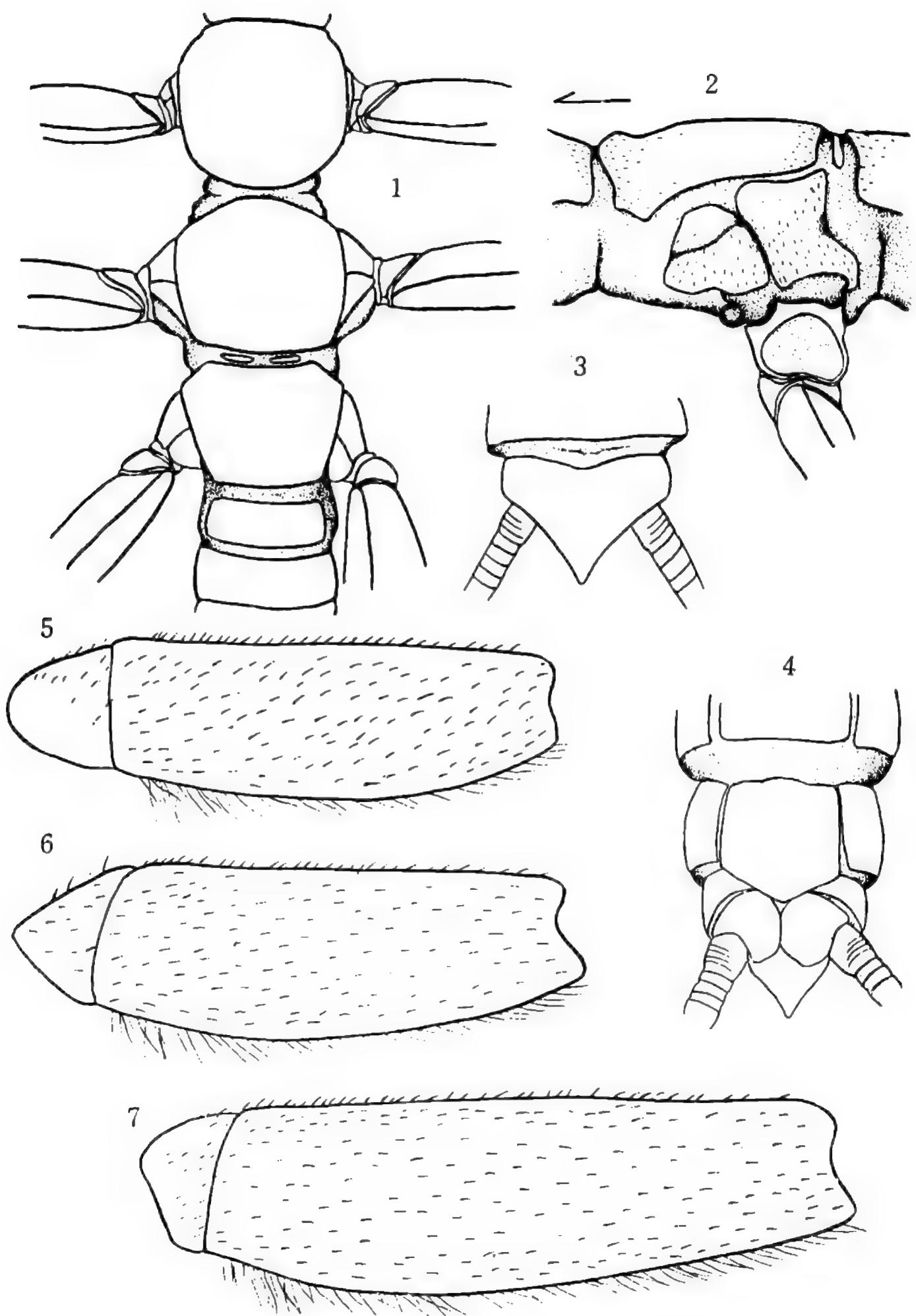


Fig. 18. *Capnia pedestris*, Nymph.

1. Thoracic segments, dorsal view; 2. Mesothorax,  
lateral view; 3. Last abdominal segments of male,  
dorsal view; 4. The same, ventral view;
5. Fore femur; 6. Mid femur; 7. Hind femur.

irregular hexagon, anterior margin more wider than posterior; without wing-pad or wing-pad processes.

Hairs fringe on posterior side of each femur (figs. 18:5, 6, 7), not vary in length towards distal end.

Abdomen uniformly brown but the tenth segment more paler; without stripe and spots on each tergum; tenth tergum (fig. 18:3) directed produced backwards in more pointed hind margin, ninth sternum (fig. 18:4) a little longer than wide, its anterior margin nearly as wide as posterior which a little extends backwards into subgenital plate with blunt pointed margin.

Locality: Two nymphal males, a small shallow clear-water stream at the water temperature 6°C in Talis (Babusal) (ca. 3,500 m a.s.l.), Kashmir, 8-X-1956; one nymphal male, upper part of the Phokar Valley, about 500 m down (ca. 4,300 m a.s.l.) from the end of the glacier, at water temperature 3°C, Punjab Himalaya, 13-IX-1956, K. YOSHIBA leg.

Remarks: The male wingless capniid species was described from the Rongbuk Glacier, Mt. Everest base camp in 1922, and its nymph was also taken from the same locality, though no description and figure were given. And also, this species were recorded by AUBERT (1959) from Gitidas of Himalaya. He has described the nymphs of his species.

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ARTICLE IV | MIYAMOTO: HEMIPTERA-  
HETEROPTERA



## IV.

### Heteropterous Insects from Iran and Afghanistan

Syôiti MIYAMOTO\*

Heteropterous material of the Karacoram-Hindukush Expeditions, 1955–1957, was very poor and included no new forms, but some data of distribution will be recorded in the present article.

#### MIRIDAE

##### 1. *Stenodema (Stenodema) laevigatum* (LINNÉ, 1758)

1758 *Cimex laevigatum* LINNÉ, Syst. Nat. ed. 10: 449.

1♀: Passargadae, Iran, 26. VIII. 1956, S. AZUMA leg.

This species is widely distributed in Europe, Caucasia, Israel, Turkestan and China, but may be a new record for Iran.

##### 2. *Trigonotylus ruficornis* (GEOFFROY, 1785)

1785 *Cimex ruficornis* GEOFFROY, in FOURCROY, Ent. Paris: 209.

1♀: Passargadae, Iran, on grass land near a stream, K. TAKAYA leg.

This species spreads widely in the Holarctic Region including Caucasia, Turkey, Israel, Egypt and Central Asia, but may be a new record for Iran.

##### 3. *Adelphocoris lineolatus* (GOEZE, 1778)

1778 *Cimex lineolatus* GOEZE, Ent. Beitr., 2: 267.

2♀: Shuruh, Iran, on herbs near a brook, 8. VIII. 1956, S. AZUMA leg; 1♀: Natter, Punjab-Hindukush, by sweeping among herbs, 6. IX. 1956.

The distribution of this species is holarctic and spreads to Iran, Pakistad and Kashmir.

##### 4. *Lygus gemellatus* (HERRICH-SCHIFFER, 1835)

1835 *Capsus gemellatus* HERRICH-SCHÄFFER, Wanz. Ins. 3: 81, f. 301.

1♀: Passargadae, Iran, on grass land near a stream, 27. VIII. 1956, K. TAKAYA leg.

This is known from Europe, Algeria, Egypt, Iran, Turkestan, China and Siberia.

\* Biological Laboratory, General Education Department, Kyushu University, Fukuoka, Japan.

## TINGIDAE

5. *Catoplatus fulvicornis* (JAKOVLEV, 1899)

1899 *Monanthia (Catoplatus) fulvicornis* JAKOVLEV, Horae Soc. Ent. Ross., 24 : 334.

1 ♀ : Kabul, Afghanistan, 2. VII. 1955, T. UMESAO leg.

This species has been recorded from Transcaucasia, Turkmenia, Turkestan and Afghanistan.

## NABIDAE

6. *Nabis pseudoferus* REMANE, 1949

1049 *Nabis pseudoferus* REMANE, Ver. Ver. naturw. Heimatf., 30 : 63.

1 ♀ : Passargadae, Iran, on grasses near a brook, 26. VIII. 1956, K. TAKAYA leg.

This species is distributed in Europe and Iran.

## REDUVIIDAE

7. *Reduvius pallipes* (KLUG, 1830)

1830 *Opsicoetus pallipes* KLUG, Symb. phys. 2, t. 19, f. 3.

1 ♂ : Neiriz, Iran, on a meadow along a roadway, 23. VIII. 1957, S. AZUMA leg.

This spreads from eastern Mediterranean Region to Turkestan through Arabia and Iran.

8. *Reduvius ciliatus* JAKOVLEV, 1879

1879 *Reduvius ciliatus* JAKOVLEV, Trudy Russ. ent. Ob. 12 : 163.

3 ♂♂ and 1 ♀ : Persepolis, Iran, at light, 27. VIII. 1956, K. TAKAYA leg.

This is known from Turkey, Israel, Syria, Iran, Transcaucasia and Caucasia.

## COREIDAE

9. *Liorhyssus hyalinus* (FABRICIUS, 1794)

1794 *Coreus hyalinus* FABRICIUS, Ent. Syst. 4 : 201.

1 ♀ : Taiwara, Afgahistan, 5. VIII. 1955, T. UMESAO leg.

This bug is cosmopolitan, excluding cold regions.

## PENTATOMIDAE

10. *Apodiphus amygdali* (GERMAR, 1817)

1817 *Halys Amygdali* GERMAR, Reise n. Dalmat.: 284, t. 9, f. 4.

1♂: Shiraz, Iran, at light, 26. VIII. 1956, K. TAKAYA leg.

The distribution of this species covers southern Europe and spreads from Israel and Syria to Turkmenia through Iraq and Iran.

11. *Carpocoris coreanus iranus* TAMANINI, 1958

1958 *Carpocoris coreanus iranus* TAMANINI, Ann. Mus. Civ. Storia Natur. 70: 169, f. 4-6 & 11-15.

1♀: Shuruh, Iran, on herbs along a small stream, 8. VIII. 1956, S. AZUMA leg.

This subspecies is originally described from Iran without detailed locality. A female specimen from Shuruh is well agreeable with the TAMANINI's description and figures, but two black striae between eyes and two hinder black spots on scutellum disappear, and a black humeral marking is reduced to linear along hind margin of humeri.

12. *Brachynema virens* (KLUG, 1845)

1845 *Cimex virens* KLUG, Symb. phys. 5, t. 44, f. 11.

This bug is a mediterranean species and has been recorded from Egypt, Israel, Syria, Iran, Transcaucasia, Caucasia and Turkestan.

13. *Eurydema (Eurydema) ornatum* var. *decoratum* (HERRICH-SCHAFFER, 1830)

1830 *Pentatoma decoratum* HERRICH-SCHÄFFER, Faun. Germ.: 116.

1♂, 1♀ and 1 nymph: Shianee, Iran, under a stone in meadow, 11. IX. 1956.

The variety is known from Europe, Israel, Syria, Iran, Turkestan and Transalai. China and India are also recorded in the OSHANIN's Catalogue.

14. *Nezara viridula* var. *torquata* (FABRICIUS, 1775)

1775 *Cimex torquata* FABRICIUS, Syst. Ent: 710.

1♀: Resht, Iran, on a leaf of *Salix* near rice-field, 19. IX. 1956, S. AZUMA leg.

This variety as well as the normal form are of wide-spread except for cold regions.

15. *Acrosternum millieri* (MULSANT and REY, 1866)

1866 *Nezara Millieri* MULSANT and REY, Hist. nat. Punai. Fr. 2: 290.

1♂: Shuruh, Iran, on an *Astragalus*-field, 8. VIII. 1956, S. AZUMA leg.

This species is distributed in southern Europe and also known from Egypt, Israel, Syria, Iraq, Arabia, Iran, Turkestan and Turkmenia.

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ARTICLE V

TSUDA & AKAGI:  
TRICHOPTERA



V.

## Caddis-fly Larvae from Karakoram

(3 text-figures)

Matsunae TSUDA\* and Ikue AKAGI\*

Among the aquatic insects collected by Drs. K. IMANISHI and K. YAMASHITA, there were found two species of caddis-fly (Trichoptera) larvae belonging to two different genera, which are described in the present paper.

*Himalopsyche* sp.

Larva broadest at the meso- and metanotum. Head of round shape, compara-

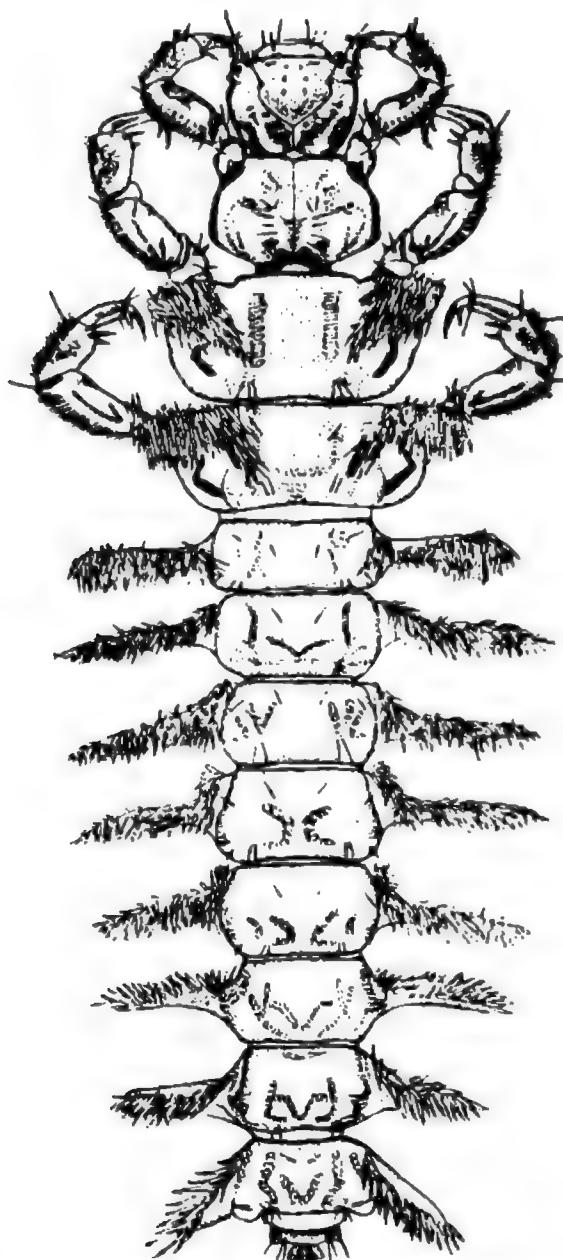


Fig. 1. *Himalopsyche* sp., larva, dorsal view

\* Zoological Institute, Department of Science, Nara Women's University.

tively small, somewhat depressed, brown-coloured, with many black spots on the pleura. Eyes far forward, immediately behind the base of mandibles. Antennae rudimentary, standing between the eyes and the mandibles. Frons rather broad, with a deep lateral indentation. Labrum broadly elliptical, joined to the frons by a long connecting membrane, anterior margin not notched, five bristles on each side, no median one. Mandibles short, blade-like; the right mandible with one tooth, the left without tooth; internal bunch of bristles absent.

Pronotum alone chitinized, wider than long, narrower posteriorly, lateral and

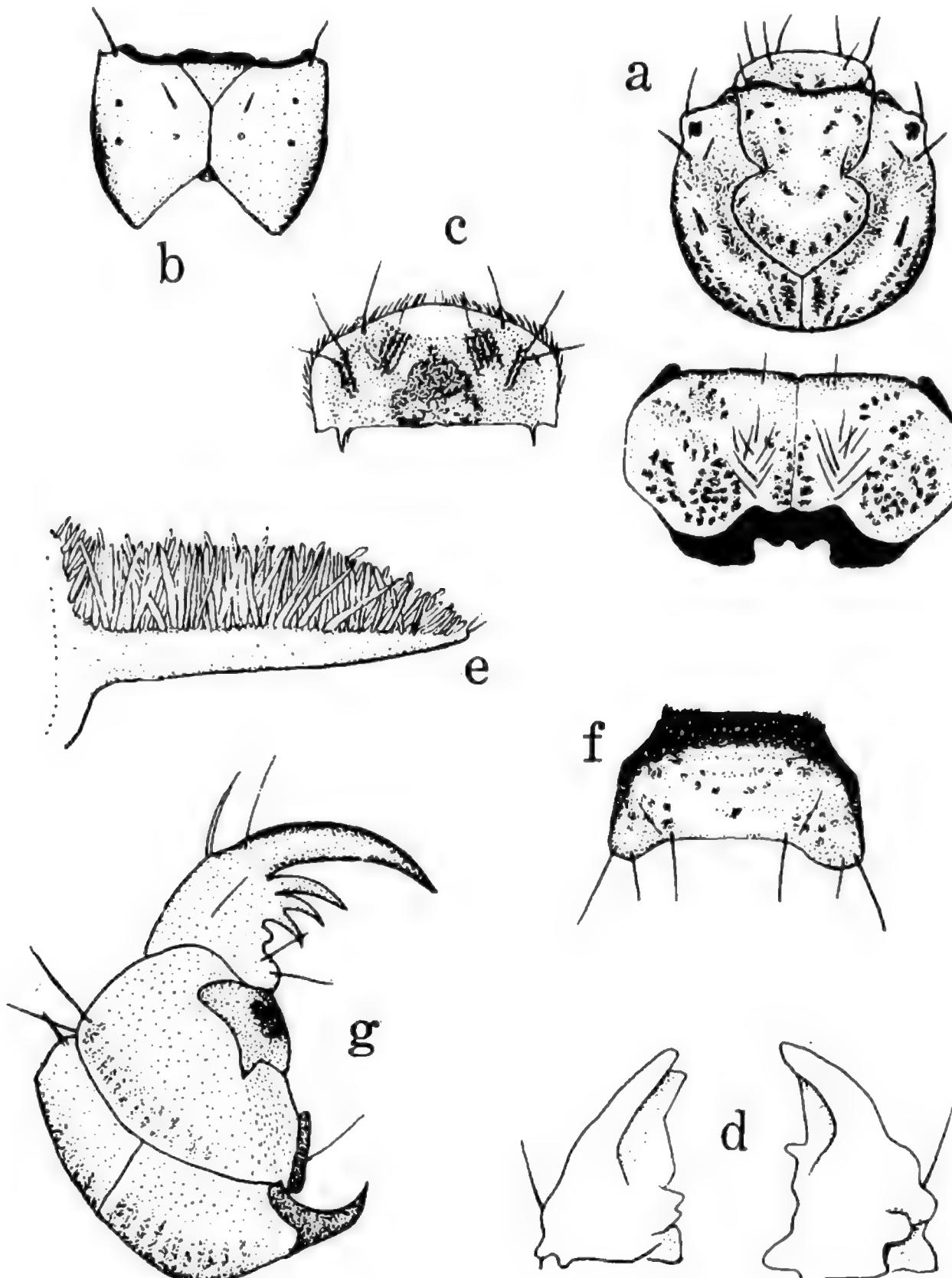


Fig. 2. *Himalopsyche* sp., larva

- a. head and prothorax, b. head, ventral view, c. labrum,
- d. mandibles, e. gills, f. plate of the 9th segment, | g. proleg.

posterior margins black, many black spots present, some strong black hairs on the central region of each sclerite. Meso- and metanotum membranous, each with a pair of black hook-shaped marks on postero-lateral parts.

Meso- and metathorax and the 1st to 8th abdominal segments have large lateral processes. The processes of thoracic segments are somewhat shorter than those of the abdominal segments. All processes carry on the dorsal surface many filamentous unbranched tracheal gills.

The 2nd to the 8th abdominal segments have a small oblong brown marking at the antero-median part of the ventral side.

Legs stout; claws short, each with a spur at base. Prolegs stout, two-segmented, with large stout claws armed with three somewhat sharp spurs. Prolegs have also a black stout claw-like process at the ventral side of the basal segment.

Body length 24 mm, body width 2.5 mm.

Material: One larva, obtained by Dr. K. IMANISHI from the mountain stream at Karga in Gilgit, Karakoram, on Aug. 25th, 1955.

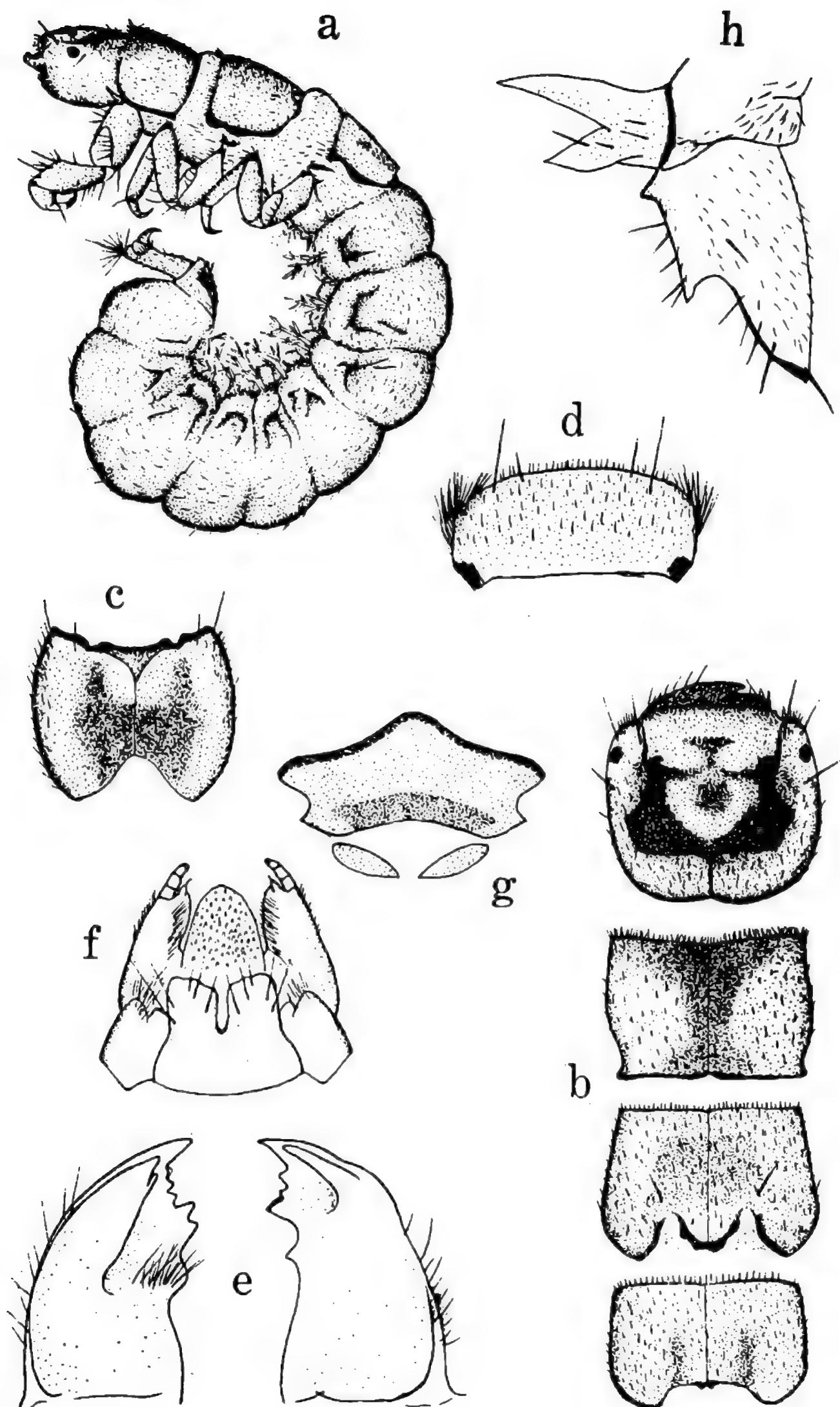
Remarks: This larva resembles the larva of the Japanese species *Himalopsyche japonica* MORTON<sup>1)</sup>; the differences between them are as follows:

Larva of <i>Himalopsyche japonica</i> MORTON	Larva of <i>Himalopsyche</i> sp. described in this article
The first abdominal segment without lateral process	The first abdominal segment with lateral process
Wart-like process present on the ventral side of lateral process	No such a process present on the ventral side of lateral process
Lateral process somewhat shorter	Lateral process longer than that of <i>Himalopsyche japonica</i>
Rod-like gill present near the base of mid- and hindlegs	No rod-like gill present

### *Hydropsyche* sp.

Head round, brownish yellow, dorsal surface with many short hairs and conspicuous black markings (see Fig. 3). Labrum transversely elliptical, with numerous short bristles dorsally and a thick bunch of lateral bristles. Mandibles strong, asymmetrical, the edge blade-like; the right mandible with four teeth, the left with five teeth; internal bunch of bristles present only on the left mandible. Maxilla slender, with many hairs and bristles.

1) *Himalopsyche japonica* MORTON is distributed in Japan (Honshu and Shikoku) and China (Kuantung), so far as known at present. Its larva is the largest among the Japanese larvae belonging to the family Rhyacophilidae.



**Fig. 3.** *Hydropsyche* sp., larva a. lateral view of larva, b. head and thorax, c. head, ventral view, d. labrum, e. mandibles, f. maxillae, g. prosternal plates, h. basal part of foreleg.

Thoracic segments covered with chitin plates of about equal size. Legs short and stout; foreleg with a two-branched stridulator on the subcoxa and a triangular process on the basal part of coxa. Prosternal plate present; it consists of a large transverse piece which is followed by two smaller ones.

Branched tracheal gills present on the ventral side of meso- and metathorax as well as of abdominal segments; conical processes also present on the abdominal segments 3-7 inclusive. They are doubtless of respiratory function.

The 8th abdominal segment with a pair of triangular chitinous shields on the ventral side. The 9th abdominal segment with a pair of larger chitinous shields on the ventral side and with four anal gills on the dorsal edge. Prolegs long, each with a bunch of long bristles at apex.

Body length 9 mm, body width 2 mm.

Material: One larva, obtained by Dr. K. YAMASHITA from a stream at Laman, Afganistan, on July 5th, 1955.

Remarks: This larva is distiguished from the larvae of the related species by the head marking and the presence of basal process of the forecoxa.



ARTICLE VI | SHIRÔZU & SAIGUSA :  
LEPIDOPTERA



## VI.

# Some Butterflies from West Pakistan and Iran

(Plates I-XVII, 32 text-figures)

Takashi SHIRÔZU\* and Toyohei SAIGUSA\*

The present report is based on the materials of butterfly collections made by the members of the Scientific Expedition of Kyoto University to West Pakistan and Iran. In the following pages, we give the descriptions and illustrations of the male genital organs as well as some characters of wing patterns for some species which we thought them to be desirable for taxonomic purposes.

Before going further, we should like to express our sincere thanks to the collectors of the materials, Prof. T. UMESAO of Osaka City University, Messrs. K. YOSHIBA, G. IWATUBO, S. AZUMA, K. OGINO, and K. TAKAYA, and to Prof. M. UÉNO who gave us the opportunity to examine them.

## Family HESPERIIDAE

### 1. *Carcharodus alceae* (ESPER, 1780)

(Pl. I, figs. 1, 2, ♂ (*isolatrix*), 3, 4, ♀ (*gooraisa*))

subsp. *isolatrix* LE CERF, 1913

2 ♂♂, Sirjan, Iran, 21. VIII. 1956, S. AZUMA leg.

subsp. *gooraisa* EVANS, 1949

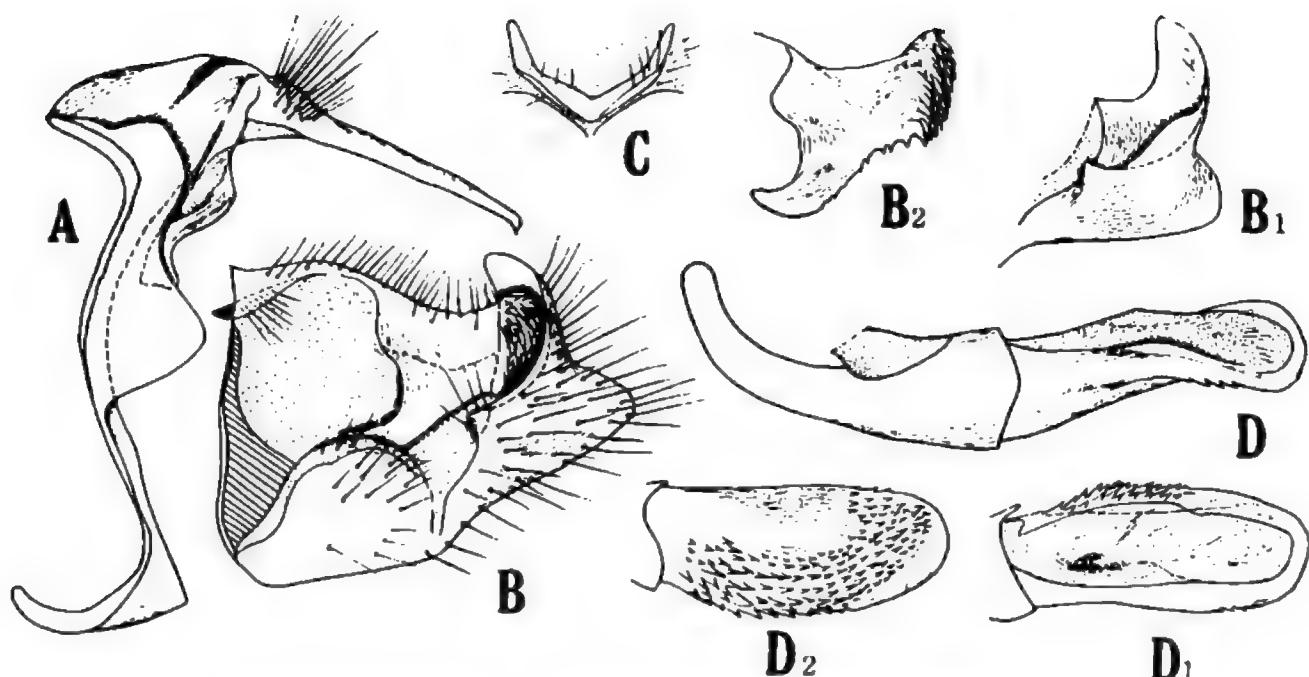
1 ♀, Saidu, W. Pakistan, 4. VII. 1957, K. YOSHIBA leg.

This species has characteristic markings on the upperside of wings and has the forewings with a transparent discocellular bar.

Male genitalia: Uncus very long and slender, simple, straight; gnathos weakly sclerotized, with its basal arms nearly obsolete; valvae short and broad, dorsal process of ampulla rounded, its apical portion armed with numerous spines and set in the concave portion of harpal process, ventral process of ampulla long and narrow, curving and directing towards base of valva; process of harpe protruded dorsally and posteriorly, and overlapping on dorsal process of ampulla; phallus long and stout, suprazonal portion of aedeagus flattened, its apex rounded, ventral side with a scobinate band from right of zone to left of subapical portion of aedeagus through dorsal surface.

The species is widely distributed from Europe, Iran, S. W. Arabia, Yemen, Afghanistan to N. W. Himalayas, and, according to EVANS (1949), it is separable

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**Fig. 1.** Male genitalia of *Carcharodus alceae* ESPER.

- A: Lateral aspect of ring.
- B: Inner aspect of right-hand valva.
- B<sub>1</sub>: Process of harpe.
- B<sub>2</sub>: Process of ampulla.
- C: Juxta.
- D: Lateral aspect of phallus.
- D<sub>1</sub>: Dorsal aspect of suprazonal portion.
- D<sub>2</sub>: Ventral aspect of suprazonal portion.

into six subspecies. Subspecies *isolatrix* is confined to Persia and Afghanistan (South of Kabul), and *gooraisa* is known from Afghanistan (Paghman Mountains), Chitral, Kashmir, Murree Hills, Simla and Mussoorie.

## 2. *Pyrgus alpinus alpinus* (ERSCHOFF, 1874)

(Pl. I, figs. 5, 6, ♂, 7, 8, ♀; text-fig. 2, ♂ genitalia)

1♂, Mochodan~Tikatoki, W. Pakistan, 22. VII. 1957, K. YOSHIBA leg.

2♂♂, Tikatoki~Diwan Gal, W. Pakistan, 23. VII. 1957, G. IWATUBO leg.

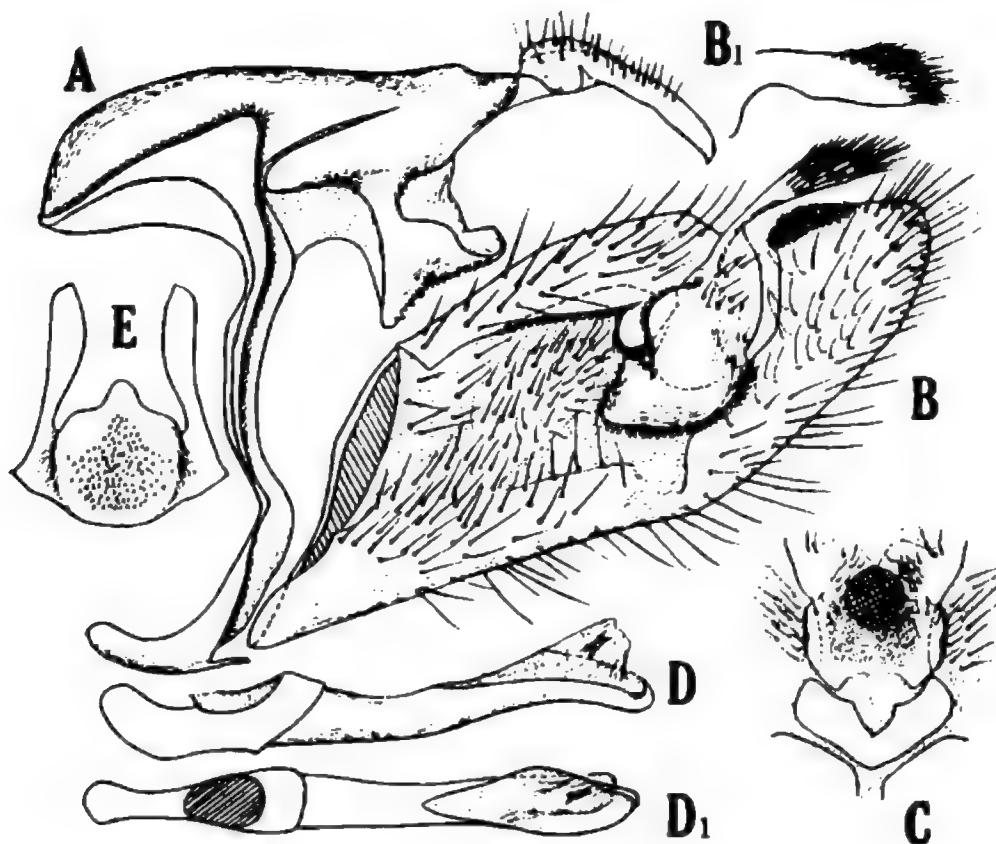
This species is peculiar in the absence of a costal fold on the male forewings among the Old World species of the genus *Pyrgus*.

Male genitalia: Gnathos with ventral lamella broad and scobinate, subparallel to tegumen; valvae large, dorsal process of ampulla long, flattened, and with dense stiff hairs at its apex, ventral process of ampulla short and broad, its distal margin spinulose, process of harpe dilating apically; phallus short, suprazonal portion of aedeagus with dorsal peri-vesical area on its apical half, vesica with a small cornutus, coecum short.

The species is spread from Samarkand, Issyk-kul, Hunza and Gilgit to Kashmir, Kumaon and Bhutan, and, according to EVANS (1949), it is separable into three subspecies. The present race inhabits the area from Samarkand to Gilgit and Chitral.

## 3. *Ochlodes venata hercana* (CHRISTOPH, 1893)

(Pl. II, figs. 1, 2, ♀)



**Fig. 2.** Male genitalia of *Pyrgus alpinus alpinus* ERSCHOFF.

- A: Lateral aspect of ring.
- B: Inner aspect of right-hand valva.
- B<sub>1</sub>: Dorsal aspect of dorsal process of ampulla.
- C: Juxta.
- D: Lateral aspect of phallus.
- D<sub>1</sub>: Dorsal aspect of phallus.
- E: Ventral aspect of gnathos.

1♀, Resht, Iran, 19. VIII. 1956, S. AZUMA leg.

The species is widely distributed all over the Palaearctic Region, and, according to EVANS (1949), it is separable into five subspecies. In the Elburz Mountains the species is represented by subsp. *hercana* CHRISTOPH, which has the narrow dark border on its wings above and large discal spots on the hindwings beneath.

### Family PAPILIONIDAE

#### 1. *Papilio machaon asiatica* MÉNÉTRIÈS, 1855

1♂, Tikatoki~Diwan Gal, W. Pakistan, 23. VII. 1957, G. IWATUBO leg.

1♀, Nazbar Pass (3,400 m), W. Pakistan, 10. VIII. 1957, G. IWATUBO leg.

A pair of specimens before us is almost identical with subsp. *asiatica* MÉNÉTRIÈS, which is characterized by having the blue lunule conjoined to the tornal red spot on the hindwing upperside, but the tail of the male hindwings is relatively shorter than in the typical *asiatica* illustrated by EVANS (1932) and TALBOT (1939).

The distribution range of the species covers all over the Palaearctic Region and N. America, and the species is separated into many geographical races.

**2. *Princeps demoleus demoleus* (LINNÉ, 1758)**

1♂, Saidu, W. Pakistan, 9. VII. 1957, K. OGINO leg.

The species is distributed from Arabia and Persia to Malaya, S. China and Formosa through India, Ceylon, Burma and Siam. It also occurs in the Lesser Sunda Islands, S. E. New Guinea and E. Australia.

**3. *Iphiclides podalirius smyrnensis* (EIMER, 1889)**

1♀, Teheran, Iran, 7. VIII. 1956, S. AZUMA leg.

The species is distributed in the districts from N. Africa and Europe to W. China through Asia Minor, Persia, Tibet and Altai.

### Family PIERIDAE

**1. *Pieris brassicae nepalensis* DOUBLEDAY, 1846**

1♂, Mochodan~Tikatoki, W. Pakistan, 22. VII. 1957, G. IWATUBO leg.

The species is widely spread from Europe to W. China, through Turkestan, Baluchistan and the Himalayas. It seems to be common in the Indian region from Baluchistan and Chitral to Assam, and the plains adjoining the Himalayas as in Europe. The Indian race is not sharply distinguished from the European one.

**2. *Pieris rapae iranica* LE CERF, 1913**

1♂, Shigure~Koshumar, W. Pakistan, 22. VI. 1957, Y. YOSHIBA leg.

1♂, Ambezth, W. Pakistan, 25. VII. 1957, G. IWATUBO leg.

1♂, Ambezth~Ghizar, W. Pakistan, 26. VII. 1957, G. IWATUBO leg.

1♀, Ghizar~Pinhal, W. Pakistan, 29. VII. 1957, G. IWATUBO leg.

1♂, Ghizar Yashin, W. Pakistan, 7. VIII. 1957, K. YOSHIBA leg.

1♂, Yashin~Batakush, W. Pakistan, 9. VIII. 1957, K. YOSHIBA leg.

This common Pierid is represented by *iranica* Le Cerf in the Indian region. The present subspecies was originally described from Persia and is distributed in the region from Mesopotamia and N. Persia to Baluchistan, Chitral, Kashmir and Ladak. The present race is not distinctly differentiated from the nominate one of Europe.

**3. *Pieris canidia indica* EVANS, 1926**

1♀, Mochodan~Tikatoki, W. Pakistan, 22. VII. 1957, G. IWATUBO leg.

There are two races of *P. canidia* LINNÉ in India, and the race in S. India is distinguished from the present race by the more weakly marked wings.

The species is distributed in the area from Turkestan and India to China and the Malay Peninsula, and may be separable into six subspecies. The present subspecies is known from N. Baluchistan and Chitral to the Dawna Range.

4. *Synchloë callidice* (ESPER, 1800)

subsp. *kalora* MOORE, 1865

1♂, The upper part of Phakos Valley, W. Pakistan, 15. IX. 1957, K. YOSHIBA leg.

This species is represented by a single race in the Indian region, subsp. *kalora* MOORE, of which the upperside of forewings has the larger discocellular marking than that of the nominate race from Europe.

According to TALBOT (1939), subsp. *kalora* MOORE flies at the edge of glaciers and snowfields at elevations 9,000–15,000 feet in Safed Koh to Chitral and Kumaon.

subsp. *chrysidice* (HERRICH-SCHÄFFER, 1844)

1♂, Mt. Demavend (3,500–3,800 m), Iran, 30. VII. 1956, S. AZUMA leg.

In the mountains of Asia Minor and Persia, the species has a reduced discocellular marking on the upperside of forewings as in the nominate form, from which the present subspecies is distinguished by the more uniformly coloured underside of hindwings.

5. *Pontia daplidice* (LINNÉ, 1758)

subsp. *moorei* (RÖBER, 1907)

1♀, Shigure~Koshumar, W. Pakistan, 22. VI. 1957, Y. YOSHIBA leg.

1♂, Saidu, W. Pakistan, 10. VII. 1957, Y. YOSHIBA leg.

1♀, The lower part of Phakos Valley, W. Pakistan, 15. IX. 1957, K. YOSHIBA leg.

1♂, Darkot~Balkulti, W. Pakistan, 11. X. 1957, K. YOSHIBA leg.

This species is distinguished from two other Indian species of *Pontia* by the large triangular greenish basal area of space 7 on the underside of hindwings. The present race is larger and more prominently marked than in the nominate one.

The distribution range of the species widely covers all over Europe, N. Africa and N. Asia. The present race inhabits Baluchistan to Chitral and Punjab.

subsp. *persica* (BIENERT, 1870)

1♀, Mt. Demavend (1,400 m), Iran, 29. VII. 1956, S. AZUMA leg.

The present subspecies is distinguished from the nominate one by the hindwing underside has more yellowish markings and the yellow veins.

It occurs in Persia.

6. *Anapheis aurota aurota* (FABRICIUS, 1793)

1♂ 1♀, Kerman, Iran, 16. VIII. 1956, S. AZUMA & K. TAKAYA leg.

1♂, Neiriz, Iran, 22. VIII. 1956, S. AZUMA leg.

This butterfly is only a single representative of *Anapheis* outside Africa, where the genus contains eight species including the present one.

The species is distributed in the districts from Africa to Ceylon, India and Nicobar Islands, through Palestine and Persia. According to TALBOT (1939), the species is separable into three subspecies.

**7. *Aporia leucodice balucha* MARSHALL, 1882**

(Pl. II, figs. 3, 4, ♂)

1 ♀, Mochodan, W. Pakistan, 21. VII. 1957, G. IWATUBO leg.

8 ♂♂ 2 ♀♀, Mochodan~Tikatoki, W. Pakistan, 22. VII. 1957, G. IWATUBO leg.

1 ♂, Tikatoki~Diwan Gal, W. Pakistan, 23. VII. 1957, G. IWATUBO leg.

The specimens before us are referable to subsp. *balucha* MARSHALL, which is distinguished from two other Indian races of *leucodice* EVERSMANN by the complete postdiscal band from costa to vein 2 on the forewing upperside and the concolorous upperside of hindwing.

According to TALBOT (1939), the species is distributed in Persia and Turkestan to Kumaon, and the present race inhabits the area from Baluchistan to Chitral and Ladak at the elevations of 8,000–10,000 feet.

**8. *Colotis fausta fausta* (OLIVIER, 1801)**

1 ♂, Neiriz, Iran, 22. VIII. 1956, S. AZUMA leg.

According to TALBOT (1936), the species is distributed in the area from Palestine to Arabia, Somaliland, Persia, W. India and Ceylon, and is separable into three subspecies. Two other races occur in the Indian region.

**9. *Gonepteryx rhamni gilgitica* TYTLER, 1926**

2 ♀♀, Darkot~Balkulti, W. Pakistan, 11. X. 1957, K. YOSHIBA leg.

1 ♂, Balkulti~Yashin, W. Pakistan, 12. X. 1957, K. YOSHIBA leg.

The above-mentioned specimens are identical with subsp. *gilgitica* TYTLER, of which females are characterized by the yellow tinge at the extreme base of costa and apex of forewing upperside and the costal and outer marginal area of hindwing upperside.

The species is widely distributed in the area from Europe and N. Asia to Baluchistan, the Himalayas and Burma in the south. It is separable into several local races. The distribution range of the present subspecies is restricted to Gilgit, Astor and Chilas, and three other races including the nominate one are known from the Indian region.

**10. *Catopsilia crocale crocale* (CRAMER, 1775)**

1 ♂, Saidu, W. Pakistan, 9. VII. 1957, K. YOSHIBA leg.

This well-known pierid is widely spread all over the Indo-Australian Region.

**11. *Colias eogene shandura* EVANS, 1926**

(Pl. II, figs. 5, 7, ♂, 6, ♀)

1 ♂, Tikatoki~Diwan Gal, W. Pakistan, 23. VII. 1957, G. IWATUBO leg.

1 ♂ 1 ♀, Nazbar Pass (3, 400m), W. Pakistan, 10. VIII. 1957, G. IWATUBO leg.

This species is a very characteristic one of *Colias* in the Indian region. Male

wings are orange-red with the immaculate broad black border, which is dusted with yellow scales on the forewings.

The species inhabits in N. W. Himalayas to Pamir and E. Turkestan, and is separable into six subspecies. The present race is distinguished from the nominate one by the linear discocellular bar of forewings above. The present subspecies is known from Chitral, Hunza and W. Karakoram.

#### 12. *Colias erate erate* (ESPER, 1805)

(Pl. II, fig. 8, Pl. III, figs. 1, 2, ♂)

1♂, Gupis~Yasin, W. Pakistan, 12. VII. 1957, K. OGINO leg.

2♂ ♂, Dachmal~Gupis, W. Pakistan, 1. VIII. 1957, K. YOSHIBA leg.

In the first two specimens a marginal black border of forewings above is almost concolorous or has very reduced yellow markings, and most of black scales on the border have rounded, not serrate, terminal margin. In the third specimen, however, the marginal black border includes well-developed yellow markings, and almost all the black scales on the border have serrate margin as in the Japanese subspecies, *poliographus* MOTSHULSKY. The male genital structures of these three specimens are identical with each other and with those of Japanese *poliographus*.

This species is spread from S. Russia to China, Japan and Formosa through Turkestan, Afghanistan, Baluchistan and India.

#### 13. *Colias erecto fieldi* MÉNÉTRIÈS, 1855

(Pl. III, figs. 3, 4 ♂, 5, 6, ♀)

1♂ 1♀, Mochodan~Tikatoki, W. Pakistan, 22. VII. 1957, G. IWATUBO leg.

1♂, Ambezth~Ghizar, W. Pakistan, 26. VII. 1957, G. IWATUBO leg.

This species is easily distinguished from the other Indian species of *Colias* by the orange-yellow ground colour of wings and a yellow sexual patch at the base of space 7 on the upperside of male hindwings.

The present species is widely distributed in Africa, Europe to W. China, through the Himalayas and Tibet.

#### 14. *Colias alpherakyi chitralensis* VERITY, 1911

(Pl. III, figs. 7, 8, ♀)

1♀, Ghizar, W. Pakistan, 29. VII. 1957, K. OGINO leg.

This yellowish species is distinguished from the other members of the genus *Colias* in the Indian region by having a large black discocellular spot on the forewing upperside, a white discocellular spot not ringed with dark colour on the hindwing underside, and the white uniform cilia.

According to TALBOT (1939), the species is known from Turkestan to Chitral, and the present race which inhabits only Chitral seems to be very rare.

## Family LYCAENIDAE

1. *Strymonidia sassanides* (KOLLAR, 1850)

(Pl. IV, figs. 1, 2, ♀)

1 ♀, Chaman, W. Pakistan, 2. VI. 1955, T. UMESAO leg.

The species is distributed in Turkestan to N. W. Himalayas through S. Persia and Baluchistan.

2. *Lycaena phlaeas stygiana* (BUTLER, 1880)

(Pl. IV, figs. 3, 4, ♂)

1 ♂, Baj Gaz Ann (4,200 m), W. Pakistan 12. IX. 1957, K. YOSHIBA leg.

The species is widely distributed all over the Palaearctic Region and is separated into many subspecies. The present race inhabits Baluchistan to Chitral and Ladak.

3. *Lycaena kasyapa* (MOORE, 1888)

(Pl. IV, figs. 5, 6, ♂ 7, 8, ♀; text-figs. 3, ♂ genitalia)

2 ♂♂, Java Lake, W. Pakistan, 22. VII. 1957, G. IWATUBO leg.

1 ♂, Mochodan~Tikatoki, W. Pakistan, 23. VII. 1957, G. IWATUBO leg.

1 ♀, Tikatoki~Diwan Gal, W. Pakistan, 23. VII. 1957, G. IWATUBO leg.

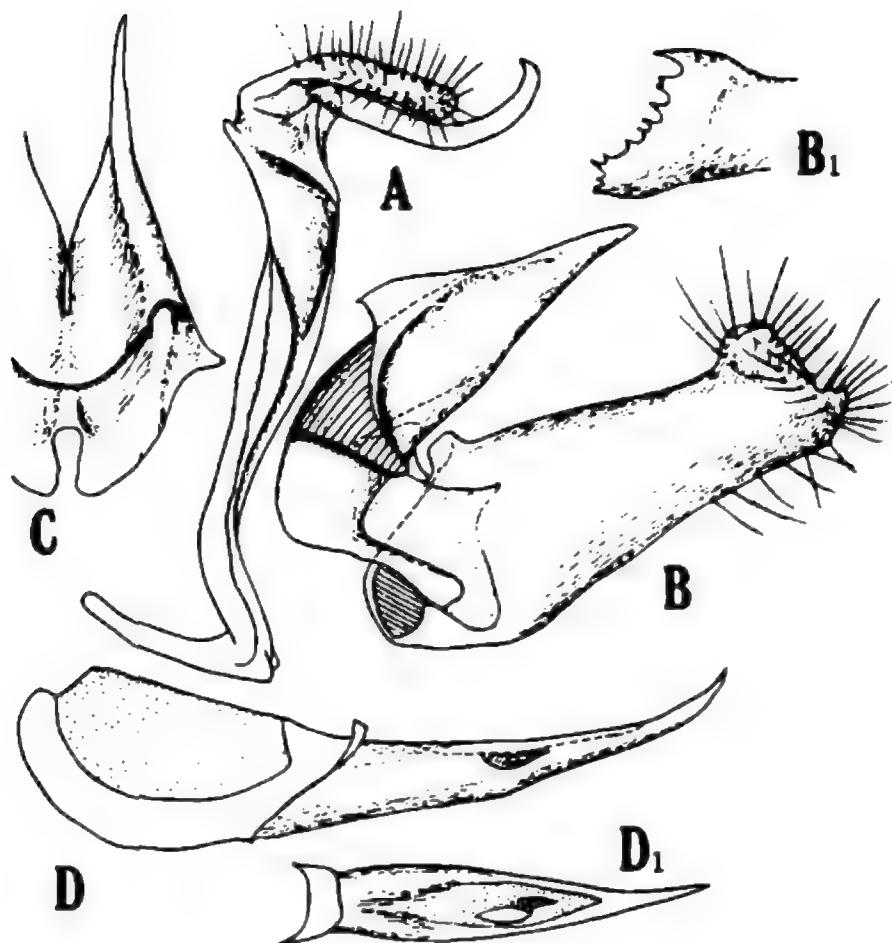
This species is characteristic of the greenish blue underside of wings.

♂. Upperside of wings bright copper-red, with a slight purplish gloss viewed from in some angle, especially on basal portion, marginal blackish border rather broad, a cell spot on forewings, prominent black discal spots and discocellular bar on both wings. The cell spot on forewings is prominent in the latter two specimens, but is absent or strongly reduced in the specimens from Java Lake. Underside of forewings greenish blue except orange discal portion, and with a minute subbasal spot in discoidal cell in addition to the similar spots on upperside; hindwings entirely greenish blue.

♀. Upperside of forewings as in *L. phlaeas stygiana* BUTLER, but hindwings dark brownish orange with the same spots as in the male, submarginal yellowish border narrow and suffused with brown; underside of forewings orange, with broad greenish marginal border and the spots as in the male.

Male genitalia: Socius short, slightly sinuating; brachia rather stout, curving and extending far posteriorly beyond tip of socius; juxta very large, lateral processes long-stretched posteriorly and acutely pointed; valvae rather long and narrow, tapering towards serrate distal margin; phallus moderately long, suprazonal portion of aedeagus tapering apically, and gently curved dorsally, a cornutus with small base on vesica.

The species inhabits only the high elevated area from Chitral to Mussoorie.



**Fig. 3.** Male genitalia of *Lycaena kasyapa* MOORE.

A: Lateral aspect of ring.

B: Inner aspect of right-hand valva with juxta.

B<sub>1</sub>: Posterior aspect of apical portion of valva.

C: Dorsal aspect of juxta.

D: Lateral aspect of aedeagus.

D<sub>1</sub>: Dorsal aspect of suprazonal portion of aedeagus.

#### 4. *Lycaena alciphron gordius* (SCHULZENS, 1776)

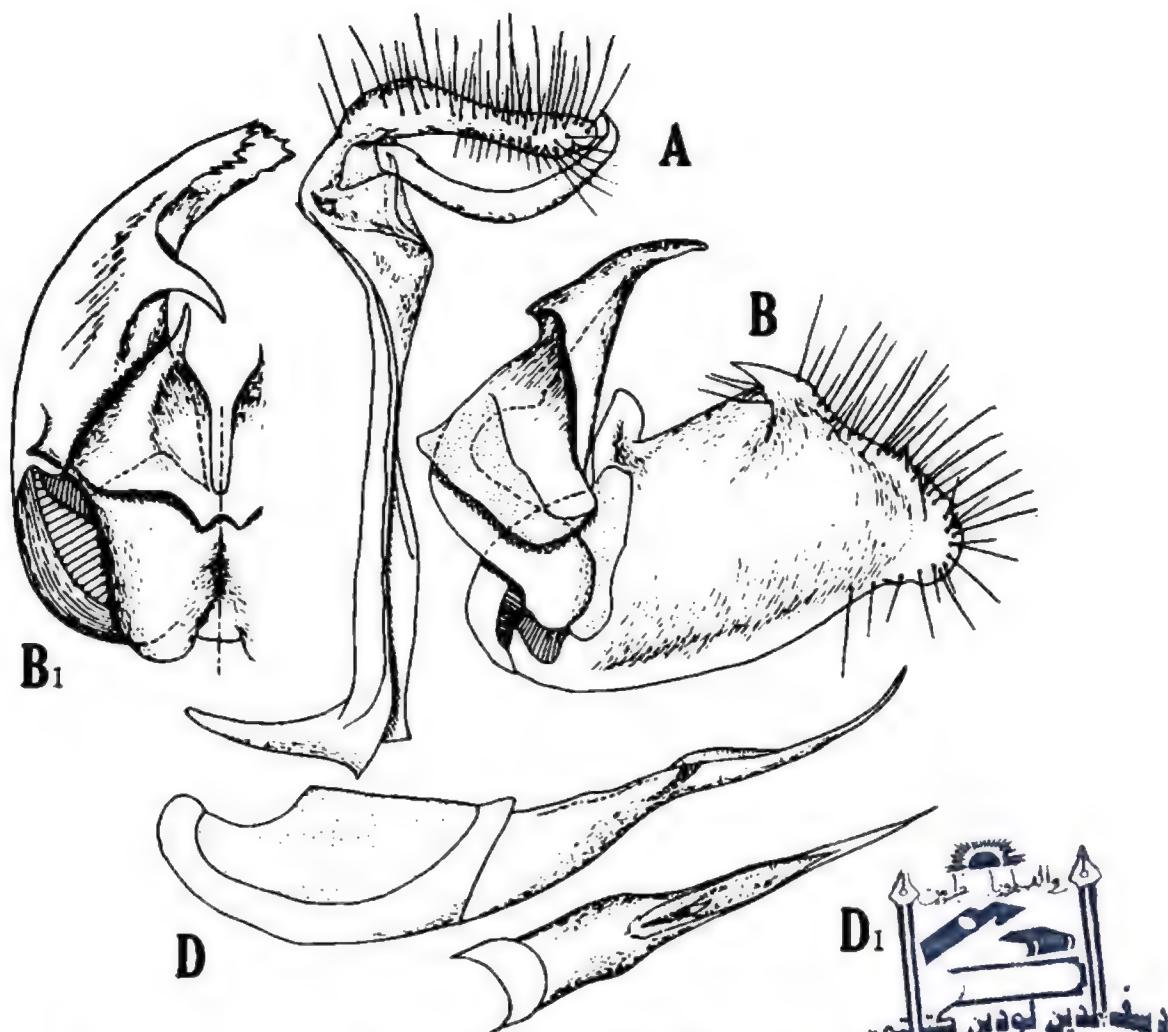
(PI. V, figs. 1, 2, ♂; text-fig. 4, ♂ genitalia)

1 ♂, Mt. Demavend, Iran, 29. VII. 1956, S. AZUMA leg.

The specimen before us is almost identical with *gordius* SCHULZENS from Europe, but somewhat brighter and larger.

♂. Upperside of wings yellowish orange with very slight purplish gloss, more reddish in hindwings than in forewings, veins narrowly black, forewings with narrow marginal border and rather broad costal border, submarginal dark spots weakly developed, inconspicuous, and conjoined with marginal border towards apex, discal spots prominent, discocellular bar and a cell spot large; hindwings with small marginal, submarginal and discal spots from spaces 1 to 5, submarginal and discal spots in space 1 conjoining with each other, discocellular bar narrow, several black scales forming a cell spot.

Male genitalia: Socius rather stout, bent ventrally at base; brachia stout, curved dorsally, with apex ending just behind socii; juxta extraordinarily large, lateral processes flattened; valvae broad, short dorsal margin with a small blunt process at



**Fig. 4.** Male genitalia of *Lycaena alciphron gordius* SCHULZENS  
A: Lateral aspect of ring.  
B: Inner aspect of right-hand valva with juxta.  
B<sub>1</sub>: Dorsal aspect of right-hand valva with juxta.  
C: Lateral aspect of aedeagus.  
D<sub>1</sub>: Dorsal aspect of suprazonal portion of aedeagus.

base and a long sharply pointed process at postero-dorsal corner of valva, distal margin oblique, its lower half with serrations, ventral margin slightly convex; suprazonal portion of aedeagus as in the preceding species, but much more strongly tapered, and a cornutus with small base on vesica.

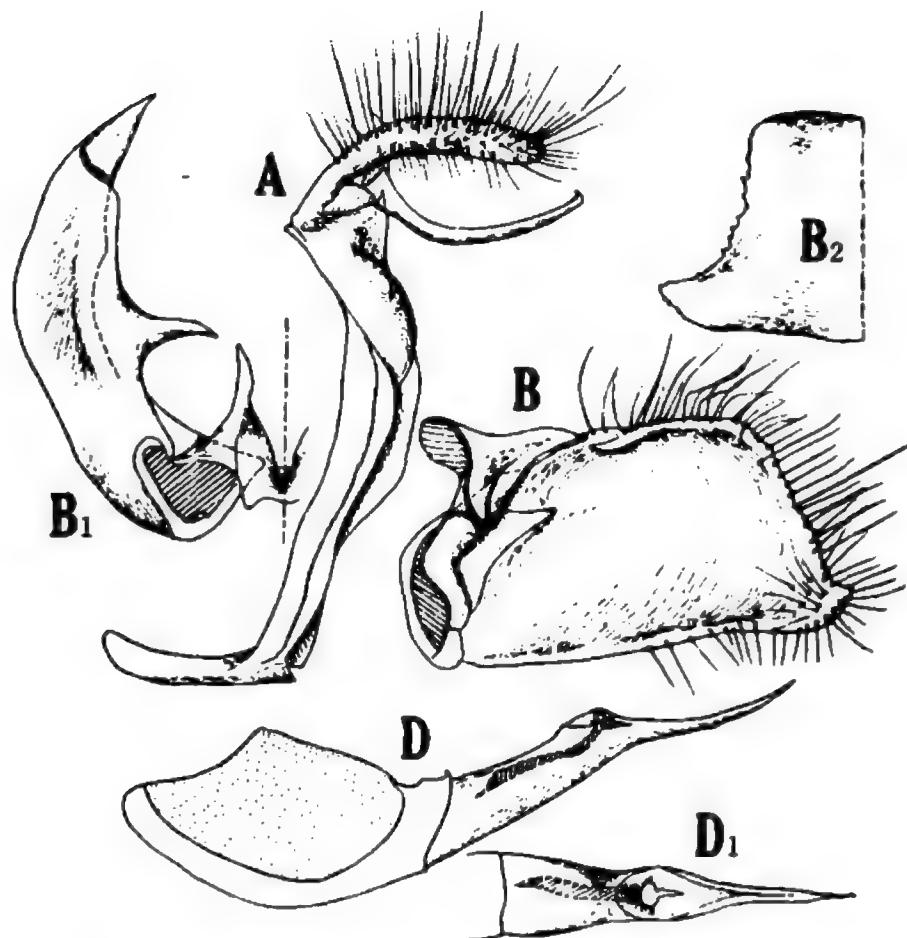
The species has a wide range of distribution from Europe to Mongolia. The present race is distributed from S. Europe to N. Persia through Greece and Asia Minor.

##### 5. *Lycaena dorilis dorilis* (HUFNAGEL, 1767)

(Pl. V, figs. 3, 4, ♂; text-fig. 5, ♂ genitalia)

1♂, Mt. Demavend, Iran, 29. VII. 1956, S. AZUMA leg.

Male genitalia: Socius long and slightly curving, brachia slender, weakly sinuating, with apex slightly exceeding posteriorly tip of socius; juxta small; valvae moderately long and broad, both ventral and dorsal margin straight, latter with a strong spiny process at middle, distal margin oblique with several serrations, postero-ventral corner produced; suprazonal sheath of aedeagus curved dorsally, slightly swollen and sinuated at middle, a cornutus with long basal sclerite on vesica.



**Fig. 5.** Male genitalia of *Lycaena dorilis dorilis* HUFNAGEL.

A: Lateral aspect of ring.

B: Inner aspect of right-hand valva with juxta.

B<sub>1</sub>: Dorsal aspect of right-hand valva with juxta.

B<sub>2</sub>: Posterior aspect of distal margin of valva.

D: Lateral aspect of aedeagus.

D<sub>1</sub>: Dorsal aspect of suprazonal portion of aedeagus.

The species is widely distributed in Europe to Iran, and the specimen before us is larger than the European one.

#### 6. *Heliophorus sena* (KOLLAR, 1848)

1♂, Nomal, W. Pakistan, 6. IX. 1957, K. YOSHIBA leg.

1♀, Gulapur, W. Pakistan, 22. X. 1957, K. YOSHIBA leg.

1♂ 2♀ ♀, Gilgit, W. Pakistan, 24. X. 1957, K. YOSHIBA leg.

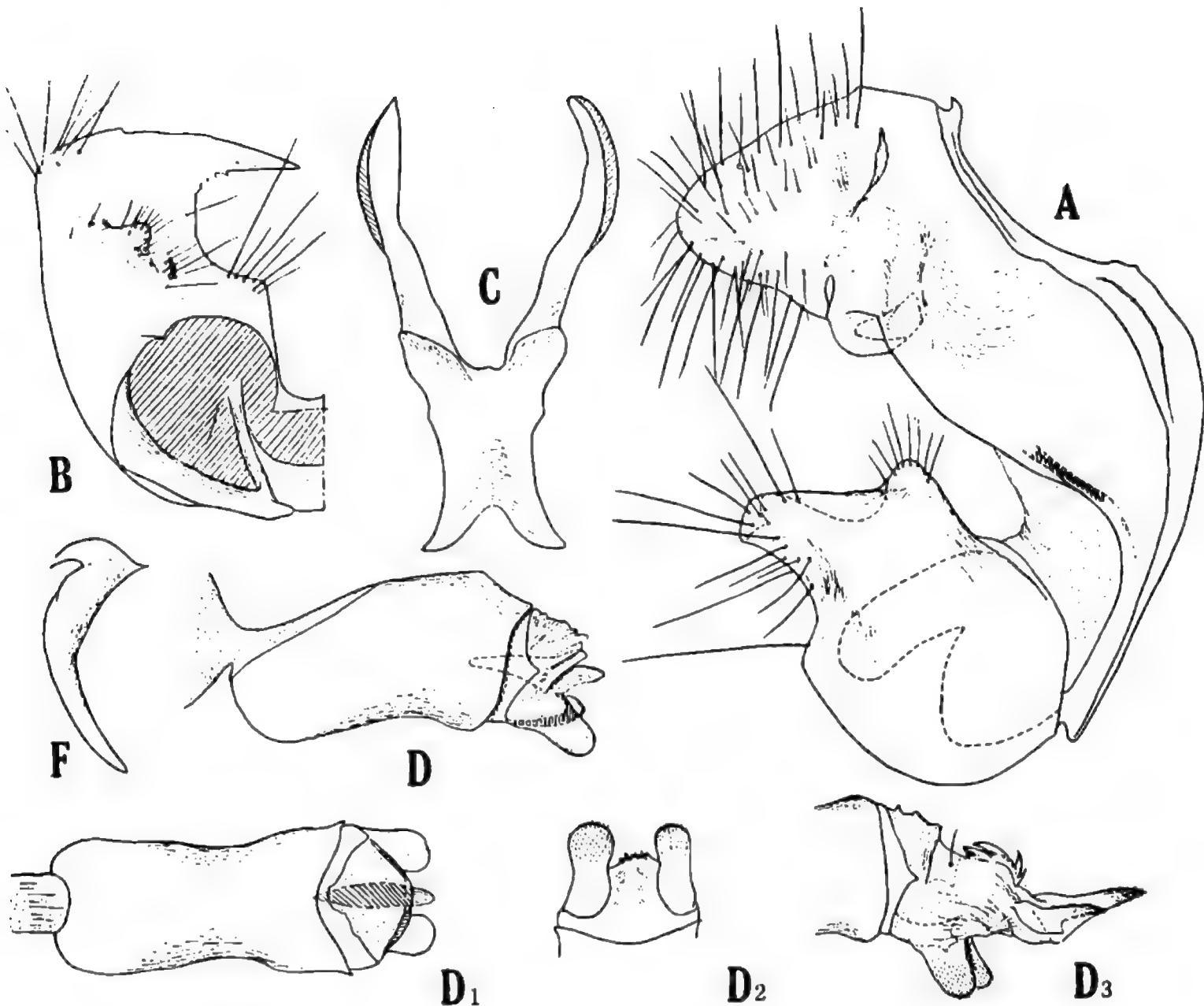
This is a peculiar species in *Heliophorus* on wing markings. The male forewings above are dusky purplish brown, while the female has submarginal orange markings on its forewings above.

According to SWINHOE (1910), this species inhabits W. Himalayas and is a common insect there up to 3,000–9,000 feet above sea level.

#### 7. *Zizeeria maha maha* (KOLLAR, 1848)

1♂ 1♀, Gulapur, W. Pakistan, 22. X. 1957, K. YOSHIBA leg.

The species is distributed in the area from Baluchistan and Kashmir to China, Japan and S. Korea.



**Fig. 6.** Male genitalia of *Scolitantides vicrama cashmirensis* MOORE.

- A: Lateral aspect of ring and valva.
- B: Dorsal aspect of right-hand valva.
- C: Juxta.
- D: Lateral aspect of phallus.
- D<sub>1</sub>: Dorsal aspect of phallus.
- D<sub>2</sub>: Ventral aspect of suprazonal portion of aedeagus.
- D<sub>3</sub>: Lateral aspect of apical half of phallus with everted vesica.
- F: Brachium.

#### 8. *Scolitantides vicrama cashmirensis* MOORE, 1874

(Pl. V, fig. 5, 6, ♂; text-fig. 6, ♂ genitalia)

1 ♂, Dachmal~Gupis, W. Pakistan, 1. VIII. 1957, K. YOSHIBA leg.

This species resembles *S. orion* PALLAS, but on the underside of hindwings the blackish half-moons of orange crowns are nearer to the outer margin than to discal spots.

Male genitalia: Resembling those of *orion*, but socius more strongly projecting posteriorly, valvae short and broad, with a strong apical hook and a preapical protuberance.

The distribution range of this species is restricted to Baluchistan, Chitral and

Kashmir, and three subspecies are known. The present race is distributed in Chitral and Kashmir to Ladak.

### 9. *Vaccinina iris ashretha* (EVANS, 1925)

(Pl. V, figs. 7, 8, ♂; text-fig. 7, ♂ genitalia)

1♂, Ghizar, W. Pakistan, 29. VII. 1957, K. OGINO leg.

This species is peculiar in appearance among the species of *Vaccinina*. The upperside of male wings is dark brown with a black discocellular spot on both wings. The underside of hindwings has ordinary spots which are large, prominent and with a white ring, and the submarginal spots in space 1 are glittered with metallic blue scales.

Male genitalia: Socius weakly flattened, outer margin bearing a dorsally projecting keel; phallus rather stout, suprazonal portion short with blunt apex, aedeagus with a pair of lateral blunt tubercles and well-sclerotized dorsal prolongation; valvae broad, process of ampulla short and broad, bluntly ending, its distal margin bearing about ten strong teeth, process of harpe with rounded margin, and not exceeding ampullar process.

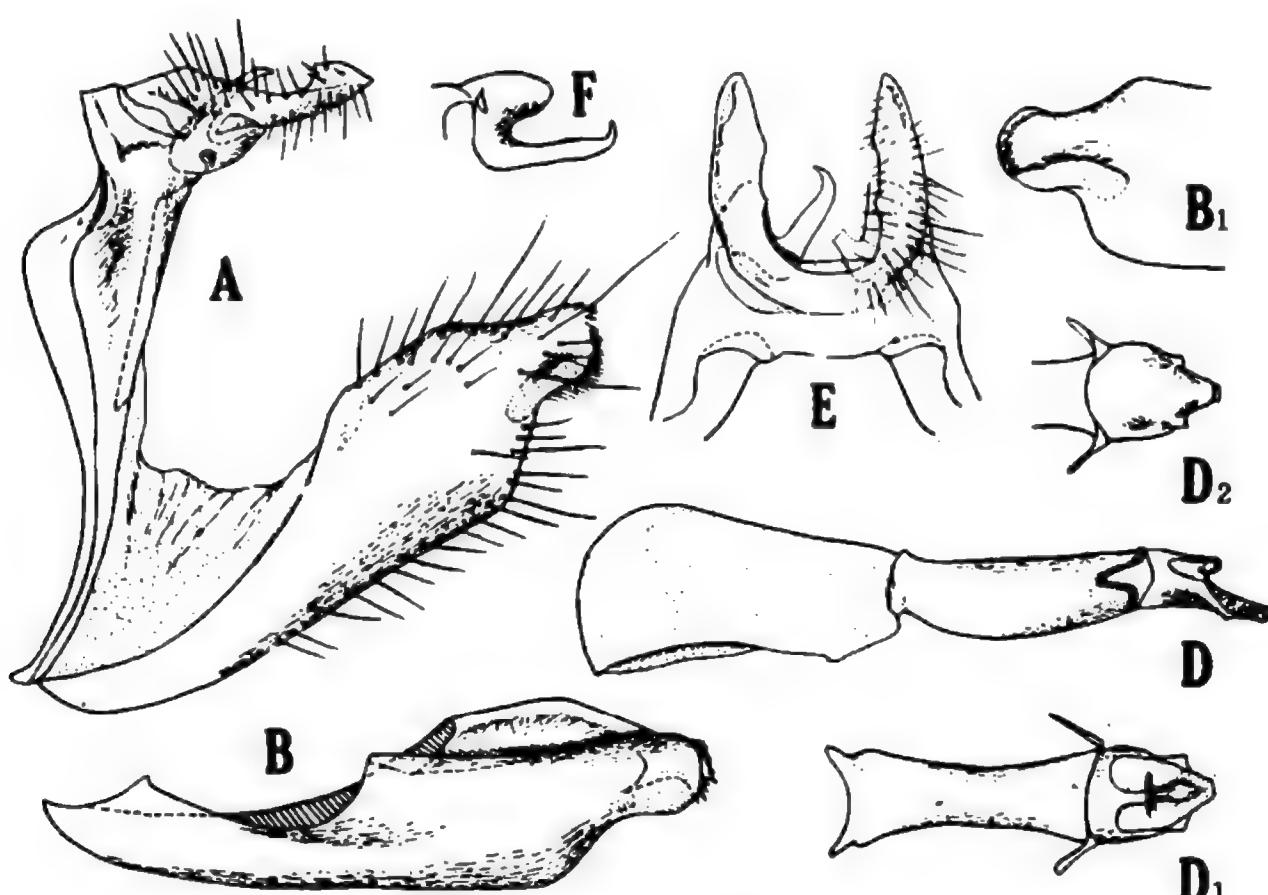


Fig. 7. Male genitalia of *Vaccinina iris ashretha* EVANS.

- A: Lateral aspect of ring and valva.
- B: Inner aspect of right-hand valva.
- B<sub>1</sub>: Outer aspect of apical portion of valva.
- D: Lateral aspect of phallus.
- D<sub>1</sub>: Dorsal aspect of phallus.
- D<sub>2</sub>: Ventral aspect of apical portion of phallus.
- E: Dorsal aspect of dorsum, apical half of left-hand brachium omitted.
- F: Brachium.

The species is distributed in Central Asia to Chitral; the present race was described from Chitral.

#### 10. *Eumedonia eumedon jermyni* (SWINHOE, 1910)

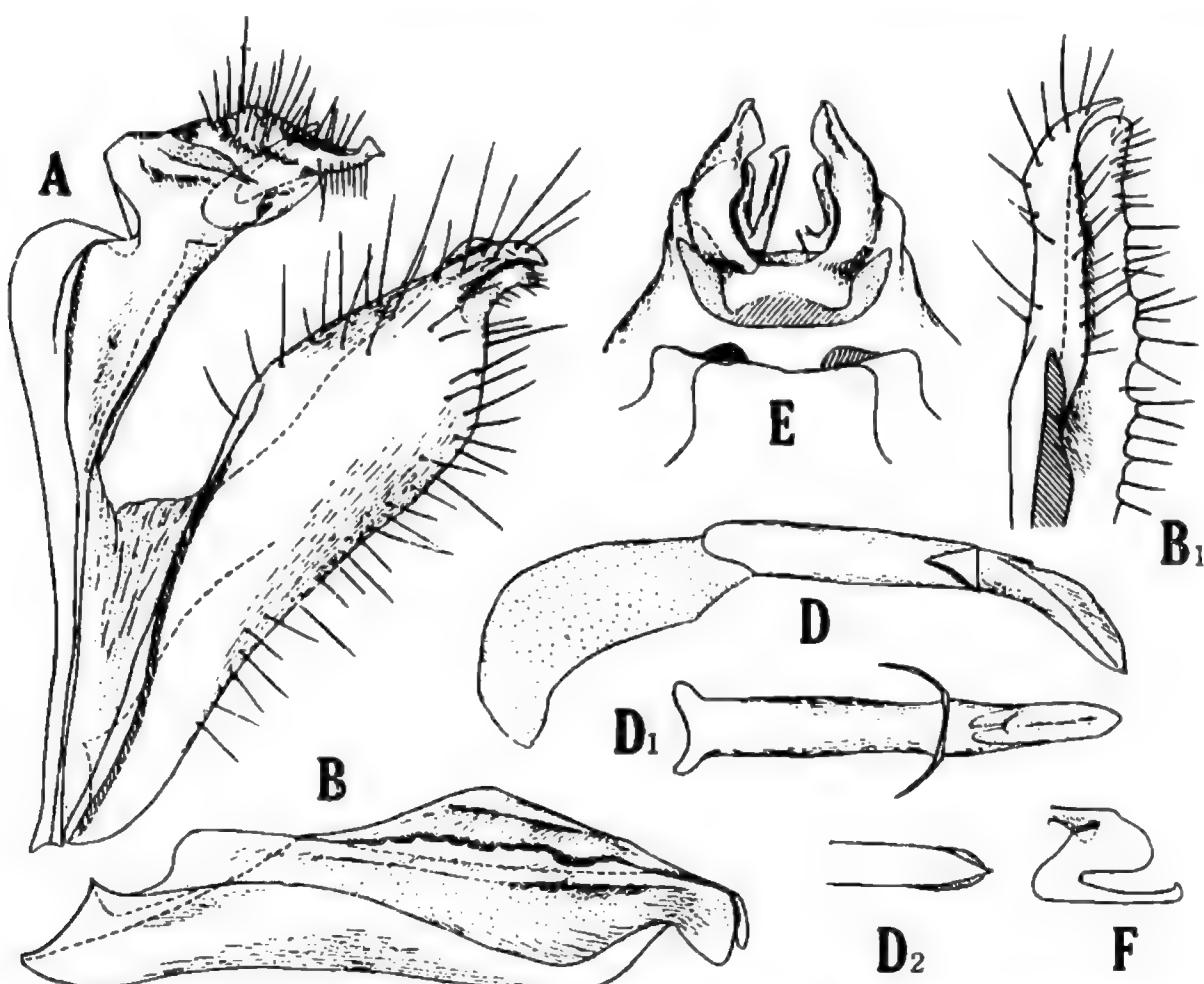
(Pl. VI, figs. 1, 2, ♂, 3, 4, ♀; text-fig. 8, ♂ genitalia)

1 ♂, Ambezth, W. Pakistan, 25. VII. 1957, G. IWATUBO leg.

1 ♀, Nazbar Pass, W. Pakistan, 10. VIII. 1957, G. IWATUBO leg.

The above-mentioned specimens from Nazbar Pass are identical with subsp. *jermyni* SWINHOE which is originally described from Babusar Pass, Rghan Valley and Gilgit. This race most resembles subsp. *antiqua* STAUDINGER.

♂. Upperside of wings dark brown with slight purplish lustre, and an obscure black discocellular bar on forewings, and without any reddish markings; fringe white, but brownish at ends of veins on hindwings, base of fringe brownish on forewings. Underside of wings dark greyish brown; forewings with a prominent white-ringed discocellular spot, four very indistinct discal spots which are black, very minute and weakly white-ringed, and obscure submarginal markings; hind-



**Fig. 8.** Male genitalia of *Eumedonia eumedon jermyni* SWINHOE.

A: Lateral aspect of ring and valva.

B: Inner aspect of right-hand valva.

B<sub>1</sub>: Dorsal aspect of apical half of valva.

D: Lateral aspect of phallus.

D<sub>1</sub>: Dorsal aspect of phallus.

D<sub>2</sub>: Ventral aspect of suprazonal portion of aedeagus.

E: Dorsal aspect of dorsum, apical half of left-hand brachium omitted.

F: Brachium.

wings covered with bluish scales on the basal one-third and with indistinct blackish discocellular bar, a whitish streak from the discocellular bar to the preapical portion of vein 5, a very indistinct small whitish discal spot in each of spaces 2 and 8, and orange-crowned obscure submarginal black spots.

♀. Upperside alike in the male, but with small very obscure submarginal orange markings on hindwings. Underside with complete series of discal spots, which are small but prominent, black and white-ringed.

Male genitalia : Socius short with apical half flattened and bearing a triangular keel; brachia with a short apical hook; valvae elongate with a process of ampulla long and slender, tapering towards apex, and without prominent serrations, free process of harpe constricted near base with ventral angle projecting, dorsal margin of harpe strongly keeled and armed with numerous dentate tubercles, each of which bears a seta; phallus long and slender, suprazonal portion long, nearly as long as two-thirds length of subzonal one, aedeagus long and curving ventrally and tapering towards apex, with a short dorsal prolongation.

The species is widely spread in Europe and N. Asia, and the present subspecies is known only from the mountain regions from Chitral to Gilgit.

#### 11. *Aricia agestis* (DENIS & SCHIFFERMÜLLER, 1775) subspecies

(Pl. VI, figs. 5, 6, ♂; text-fig. 9, ♂ genitalia)

1 ♂, Ambezth (3,800m), W. Pakistan, 25. VII. 1957, G. IWATUBO leg.

♂. Upperside of wings dark brown, with submarginal orange markings almost entirely obsolete, a black discocellular bar of forewings well marked. Underside of wings pale grey, the blackish spots and orange markings much smaller than those of European races, the white ring of black spots obscure.

Male genitalia: Socius long and broad, compressed, apical half of dorsal margin keeled and with a spiny process at middle; brachia simple and with blunt apex; valvae elongate with a process of ampulla long and slender, tapering towards apex, ornamented with minute serrations, dorsal margin of harpe strongly keeled and with many spiny tubercles; phallus long and slender with suprazonal portion slightly longer than subzonal portion, suprazonal portion of aedeagus curving near zone, tapering towards rather acutely pointed apex, a dorsal prolongation of aedeagus on peri-vesical area absent.

The species is widely distributed in Europe to N. Asia.

#### 12. *Albulina metallica gilgitica* (TYTLER, 1926)

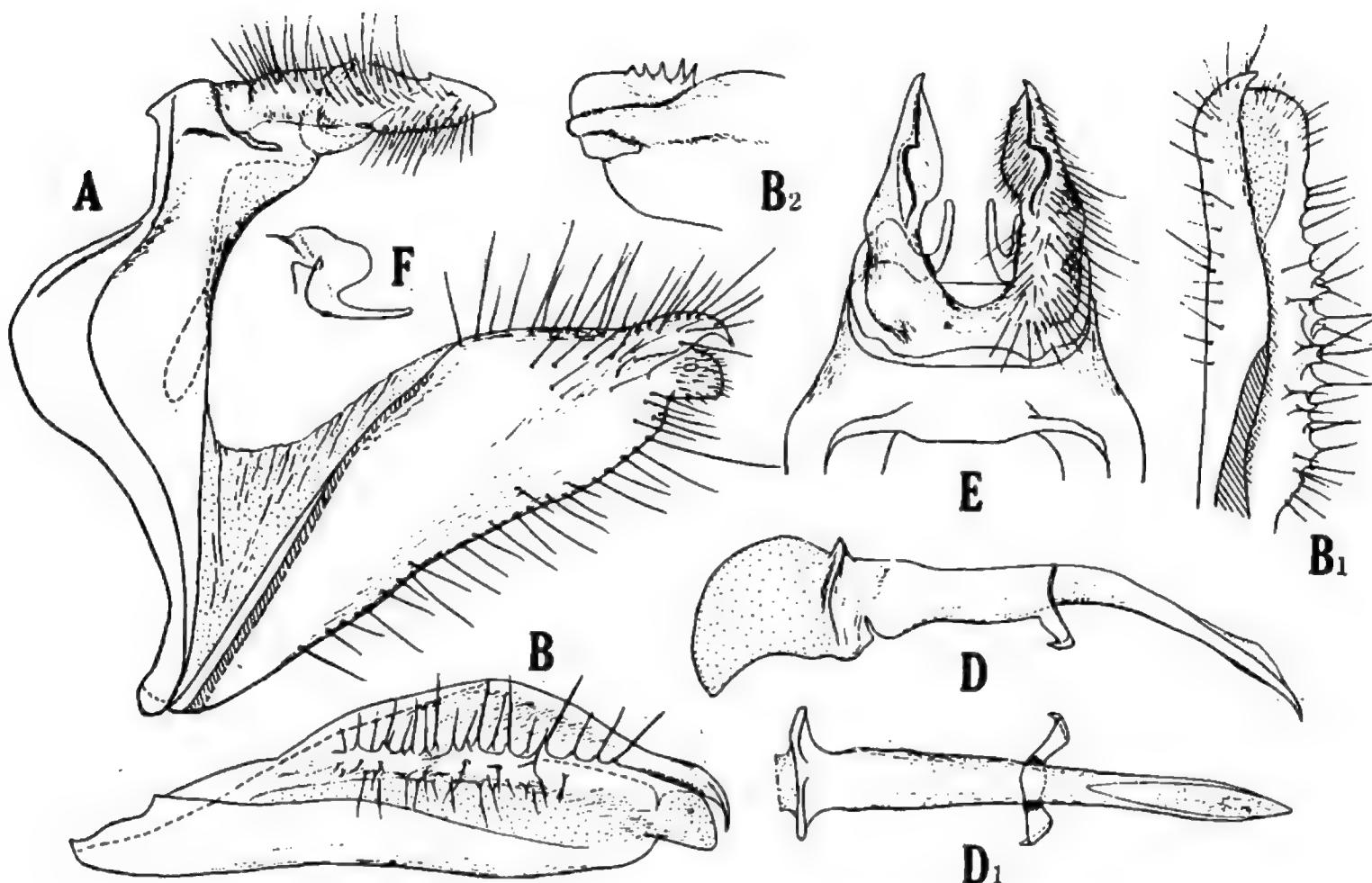
(Pl. VI, figs. 7, 8, ♂, Pl. VII, figs. 1, 2, ♀; text-fig. 10, ♂ genitalia)

5 ♂ ♂, Ambezth~Ghizar, W. Pakistan, 26. VII. 1957, G. IWATUBO leg.

5 ♂ ♂ 1 ♀, Nazbar Pass, W. Pakistan, 10. VIII. 1957, G. IWATUBO leg.

1 ♀, Nazbar Pass, W. Pakistan, 10. VIII. 1957, K. OGINO leg.

Some of the specimens listed above are somewhat different from the typical



**Fig. 9.** Male genitalia of *Aricia agestis* DENIS & SCHIFFERMÜLLER subsp.

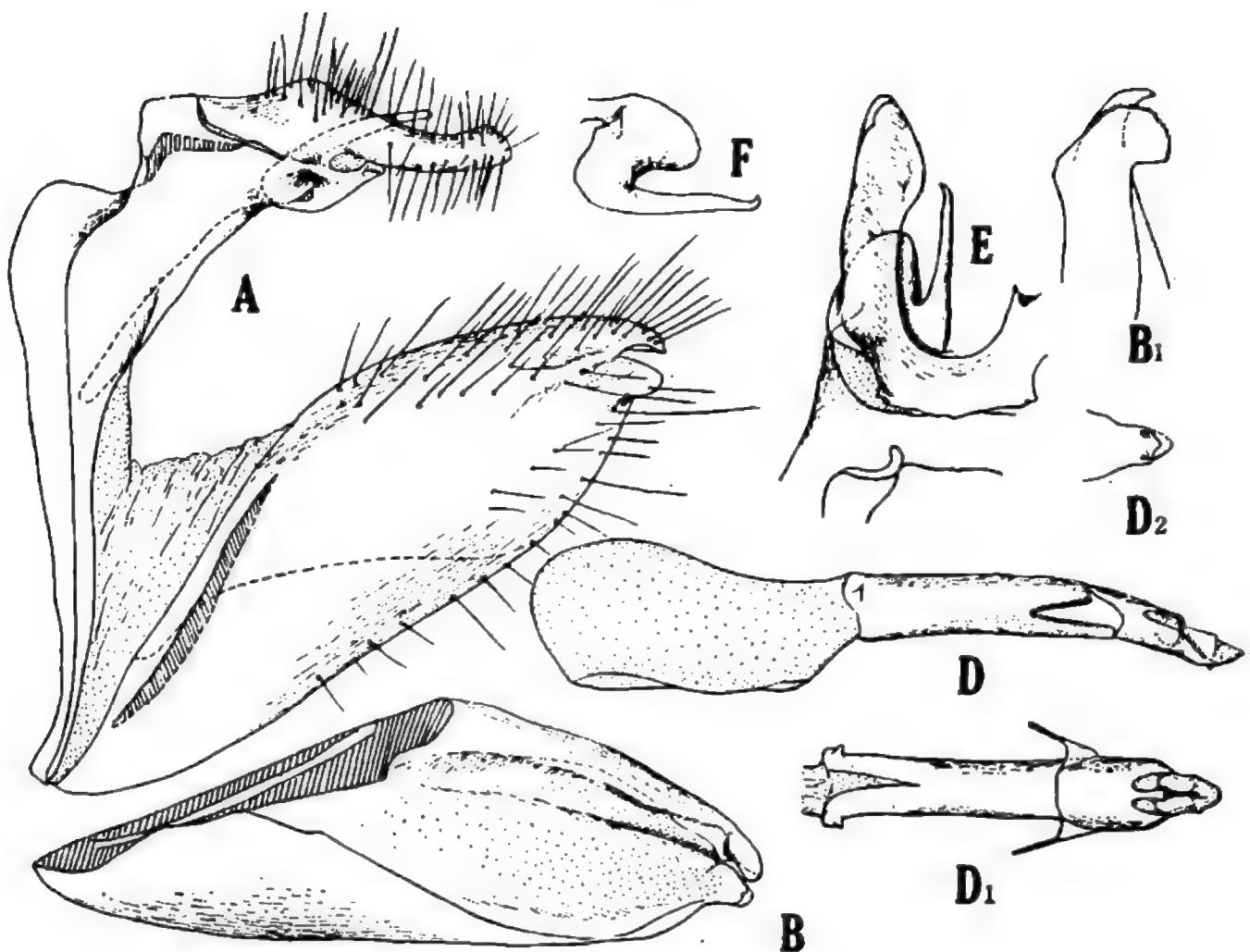
- A: Lateral aspect of ring and valva.
- B: Inner aspect of right-hand valva.
- B<sub>1</sub>: Dorsal aspect of apical half of valva.
- B<sub>2</sub>: Outer aspect of apical portion of valva.
- C: Lateral aspect of phallus.
- D: Dorsal aspect of phallus.
- E: Dorsal aspect of dorsum.
- F: Brachium.

*gilgitica* TYTLER, but as we have no Indian specimens of *galathea* group to compare with, we provisionally identify them with subsp. *gilgitica* TYTLER.

♂. Upperside of wings dusky purplish blue, the ground colour intermediate between those of *Polyommatus sarta sartoides* SWINHOE and *P. icarus* ROTTEMBURGH; both wings with blackish border, its width on forewings about 1 mm in the specimens from Nazbar Pass, 2/3 mm in the specimens from Ambezth~Ghizar; fringe white, but on forewings its base rather brownish. Underside of forewings uniformly pale grey, with a black discocellular bar and discal spots obscurely white-ringed, underside of hindwings uniformly greenish with obscure white discocellular bar and a small white discal spot in each of spaces 4, 5 and 7 respectively, those in spaces 4 and 7 often obsolete; veins greyish.

♀. Upperside brown, discocellular portion and basal half of discoidal cell and space 1 of forewings and the extreme base of hindwings sparsely clothed with bluish scales; underside as in the male.

Male genitalia: Socius long, flattened, and slightly keeled on apical half of outer



**Fig. 10.** Male genitalia of *Albulina metallica gilgitica* TYTLER.

- A: Lateral aspect of ring and valva.
- B: Inner aspect of right-hand valva.
- B<sub>1</sub>: Dorsal aspect of apical portion of valva.
- C: Lateral aspect of phallus.
- D: Dorsal aspect of phallus.
- D<sub>1</sub>: Ventral aspect of apical portion of aedeagus.
- E: Dorsal aspect of dorsum, left-hand socius and brachium omitted.
- F: Brachium.

margin; apical half of brachium slender and slightly sinuating, with weakly hooked apex; valvae long and broad with a process of ampulla short, broad and curving inwardly, a process of harpe short and narrow, with acutely pointed tip; phallus moderately large, suprazonal portion nearly one-third as long as phallus, aedeagus strongly constricted near apex, and bearing a pair of small tubercles, short dorsal prolongation of aedeagus situated on peri-vesical area which has a pair of weakly sclerotized plates.

The species inhabits the northern part of W. Pakistan, and, according to EVANS (1932), it is separable into three subspecies. The present race is known from Chitral, Shandur, Baroghil, Gilgit, Astor and Chilas.

### 13. *Polyommatus sarta sartoides* SWINHOE, 1910

(Pl. VII, figs, 3, 4, ♂, 5, 6, ♀; text-fig. 11, ♂ genitalia)

1 ♂, Ambezth~Ghizar, W. Pakistan, 26. VII. 1957, G. IWATUBO leg.

1♂ 1♀, Nazbar Pass, W. Pakistan, 10. VIII. 1957, G. IWATUBO leg.

1♂, Ghizar, W. Pakistan, 29. VIII. 1957, K. OGINO leg.

♂. Upperside of wings as in *P. eros* OCHSENHEIMER, but ground colour more purplish and submarginal black spots of hindwings usually free from dark border. Underside as in typical *P. icarus* ROTTEMBURG, the blackish spots much more strongly developed; discal spots and a subbasal spot in space 1 and cell spot absent, discocellular bar of hindwings white, submarginal markings of forewings not orange-crowned, crescent-shaped black markings on submargin of hindwings nearer to submarginal rounded spots than to discal spots, submarginal rounded spots in spaces 2 and 3 with bluish scales.

♀. Upperside dark brown, a faint blackish discocellular bar and orange submarginal band on forewings, hindwings with half-moon orange submarginal spots.

Male genitalia: Socius long and broad, flattened and with serrate ventral margin; brachia short; valvae long and broad, a process of ampulla broad and fan-shaped, with minutely serrated, rounded distal margin, a process of harpe very broad; phallus long, suprazonal sheath nearly as long as subzonal one, aedeagus flattened and dilating towards apex, and with rounded distal margin, dorsal prolongation of

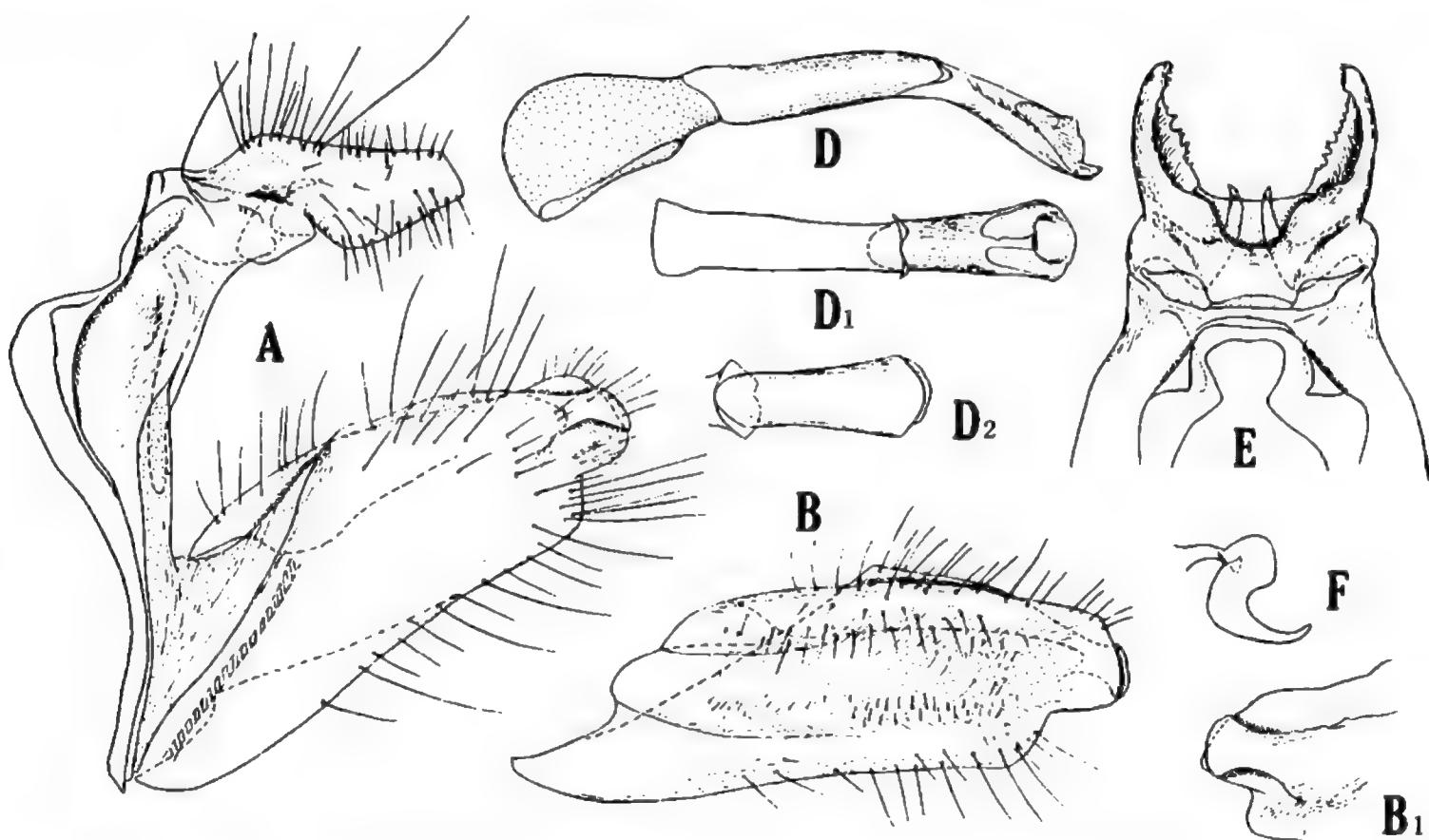


Fig. 11. Male genitalia of *Polyommatus sarta sartoides* SWINHOE.

- A: Lateral aspect of ring and valva.
- B: Inner aspect of right-hand valva.
- B<sub>1</sub>: Outer aspect of apical portion of valva.
- D: Lateral aspect of phallus.
- D<sub>1</sub>: Dorsal aspect of phallus.
- D<sub>2</sub>: Ventral aspect of suprazonal portion of aedeagus.
- E: Dorsal aspect of dorsum.
- F: Brachium.

aedeagus well developed.

The species inhabits the area from Turkestan to Chitral and Kashmir, and, according to EVANS (1932), it is separable into five subspecies. The present race is restricted to Chitral.

#### 14. *Polyommatus icarus* (ROTTENBURG, 1775)

(Pl. VII, figs. 7, 8, ♂, Pl. VIII, figs. 1, 2, ♀ (*persica*), figs. 3, 4, ♂, 5, 6, ♀ (*fugitiva*), figs. 7, 8, ♀ (*chitralensis*); text-fig. 11, ♂ genitalia)

subsp. *persica* BIENERT, 1870

1 ♂ 1 ♀, Mt. Demavend, Iran, 29. VII. 1956, S. AZUMA leg.

♂. Upperside of wings as in the typical *icarus* from Europe; underside pale brownish grey, with ordinary markings, but a white patch along vein 4 between discal spots and submarginal spots on hindwings rather obscure. Length of forewings 14.5 mm.

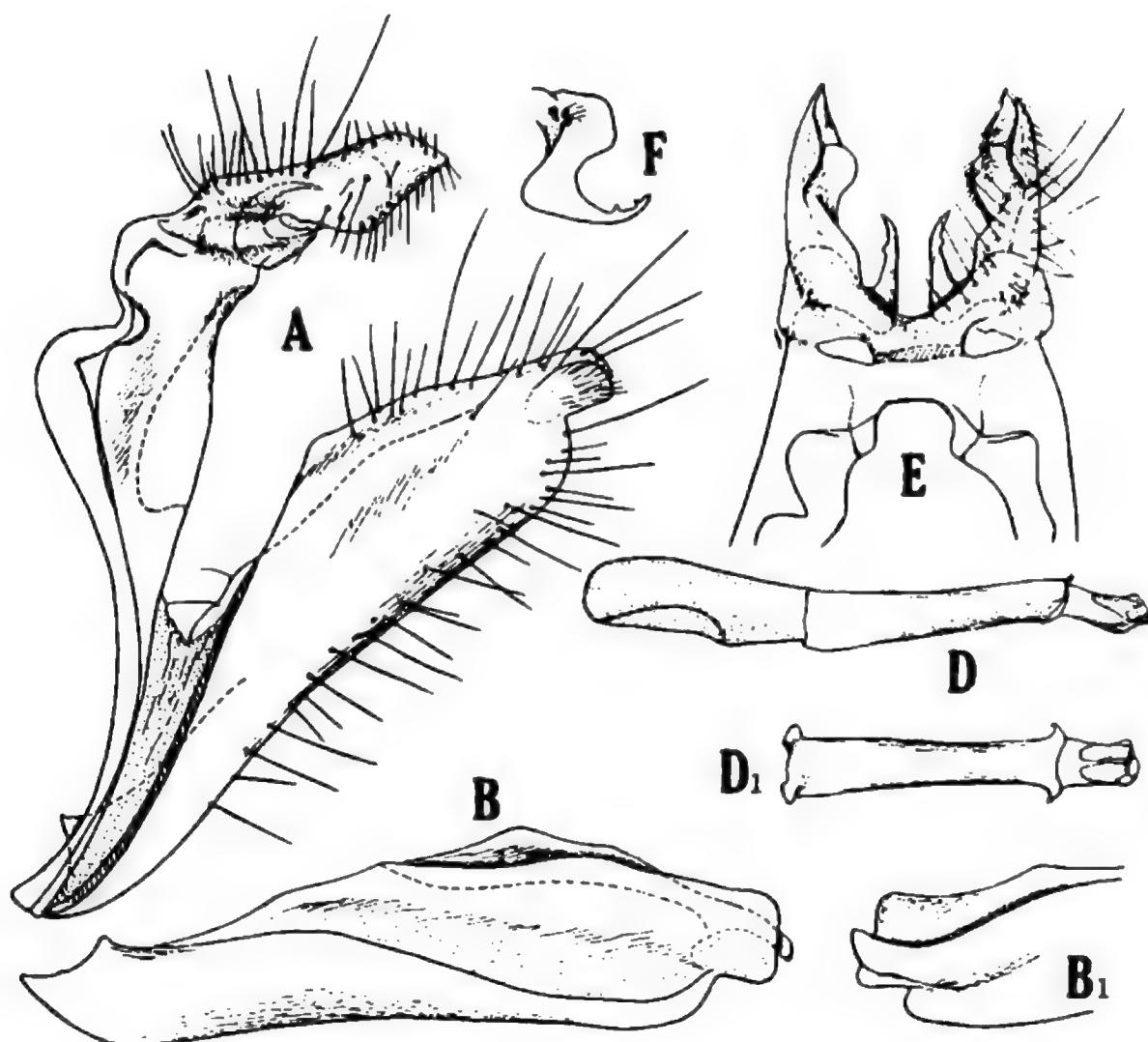


Fig. 12. Male genitalia of *Polyommatus icarus fugitiva* BUTLER.

- A: Lateral aspect of ring and valva.
- B: Inner aspect of right-hand valva.
- B<sub>1</sub>: Outer aspect of apical portion of valva.
- D: Lateral aspect of phallus.
- D<sub>1</sub>: Dorsal aspect of phallus.
- E: Dorsal aspect of dorsum.
- F: Brachium.

subsp. *fugitiva* (BUTLER, 1881)

1♂ 1♀, Taiwara, Afganistan, 6. VIII. 1955, T. UMESAO leg.

♂. Upperside purplish blue as in the typical *icarus*; underside identical with *fugitiva* illustrated by EVANS (1932) (the photograph of *fugitiva* was incorrectly designated as *eros* on plate XXVII in his "The identification of Indian butterflies"). Underside pale ash grey, forewings with a faint discocellular bar, a minute cell spot, discal spot in each of spaces 2 to 6 small and not white-ringed, and obscure submarginal markings without orange crown. Markings of hindwings small and obscure, a discocellular bar almost obsolete; discal spots, a cell spot and a subbasal spot in space 1b+c minute; a discal spot in spaces 1b+c and 6 almost disappearing; a subbasal spot and discal spot in space 7 more prominent than the other markings; submarginal markings faint with obscure orange crown. Length of forewings 12.5 mm.

subsp. *chitralensis* SWINHOE, 1910

1♀, Yasin~Batakush, W. Pakistan, 9. VIII. 1957, K. YOSHIBA leg.

1♂, Baj Gaz Ann, W. Pakistan, 13. IX. 1957, K. YOSHIBA leg.

A pair of specimens before us is identical with subsp. *chitralensis* SWINHOE originally described from Chitral. The markings on the underside are more prominent than in the preceding subspecies, and a white patch along vein 4 on hindwing beneath is prominent. Length of forewings 16 mm (♂) and 15 mm (♀).

Male genitalia: Socius long, rather broad and compressed, with dorsal margin keeled, ventral margin not serrate, inner wall of socius concave; brachia short; valvae long and narrow, a process of ampulla long and slender with several minute serrations at apical portion of outer margin; phallus short and rather slender, supranodal portion very short with rounded tip.

The species is widely distributed in Europe and N. Asia and it is separated into many subspecies.

15. *Polyommatus eros* (OCHSENHEIMER, 1808) subspecies

(Pl. IX, figs. 1-8, Pl. X, figs. 1, 2, ♂, figs. 3-6, ♀; text-fig. 12, ♂ genitalia)

2♂ ♂, Mochodan, W. Pakistan, 21. VII. 1957, G. IWATUBO leg.

1♂, Java Lake, W. Pakistan, 21. VII. 1957, G. IWATUBO leg.

2♂ ♂ 1♀, Tikatoki~Diwan Gal, W. Pakistan, 23. VII. 1957, G. IWATUBO leg.

4♂ ♂, Ambezth~Ghizar, W. Pakistan, 26. VII. 1957, G. IWATUBO leg.

3♂ ♂ 1♂, Vicinity of Nazbar Pass (3,400 m), W. Pakistan, 10. VIII. 1957, G. IWATUBO leg.

1♂, Baj Gaz Ann, W. Pakistan, 12. IX. 1957, K. YOSHIBA leg.

More than ten *eros*-like species of the *Polyommatus* had been described from Baluchistan, Chitral and Kashmir, but EVANS (1932) considered they were merely the local races of *P. eros* OCHSENHEIMER. In the present collection, we found thirteen male specimens of *Polyommatus* which have narrow 5-6 ribbed androconia and

the more bluish upperside of wings than in the typical *icarus* ROTTENBURG. They apparently belong to some Indian races of *eros* in the sense of EVANS. These specimens, however, are different from each other in the markings of underside and the breadth of blackish border of upperside.

As Indian subspecies of *eros* are not sufficiently studied, we cannot determine the subspecific identification of these specimens.

♂. Ground color of upperside like that of *P. sarta sartoides* SWINHOE, but more bluish than European *icarus* and more purplish than European *eros*, marginal border of both wings in a thread to 0.5 mm, but marginal portion of wings usually more or less suffused with dark scales, the border 1 mm in specimens from Java Lake and Ambezth~Ghizar which have submarginal black spots on hindwings; discocellular bar absent. Underside variable in ground colour and submarginal markings, but the black spots prominent and a discocellular marking on hindwings almost entirely white, and with a thin grey, obscure discocellular vein in several specimens, submarginal markings of hindwings usually reduced, and in the specimens from Nazbar Pass the markings entirely replaced by white patches.

♀. In a specimen from Tikatoki~Diwan Gal the upperside of wings sparsely clothed with bluish scales from the base to the submarginal markings which are orange and very prominent; underside of wings with well-developed submarginal markings. In a specimen from Nazbar Pass, upperside dark brown with sparse bluish scales on space 1 and basal half of space 2 of forewings and an obscure orange spot in space 2 on hindwings, forewing apex more or less acutely pointed.

Male genitalia: Very much resembling those of *icarus*, but valvae generally broader than in *icarus* and process of ampulla usually not exceeding that of *harpe*.

The species is widely distributed in the Palaearctic Region and is separated into many subspecies.

#### 16. *Lycaeides christophi samudra* (MOORE, 1874)

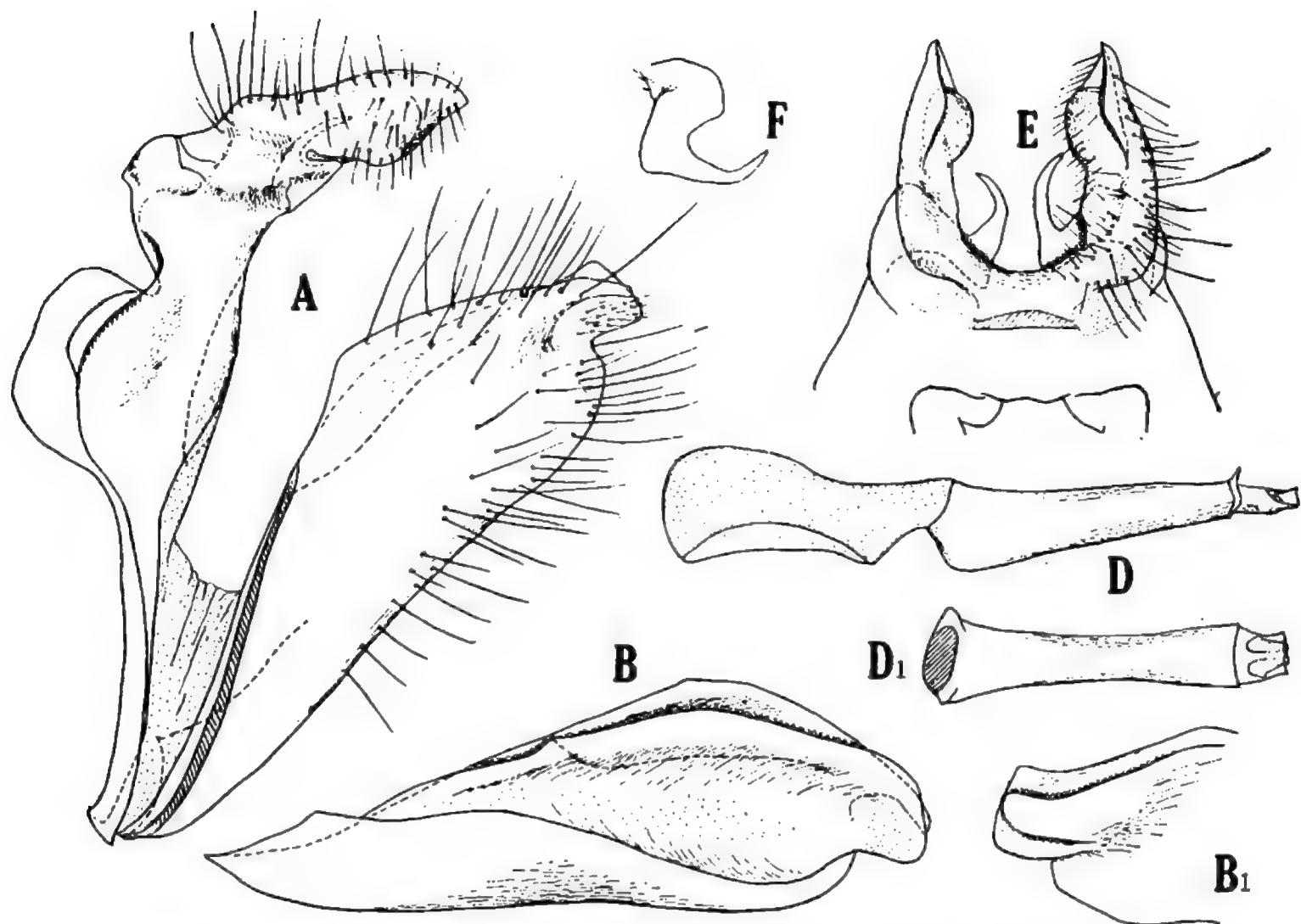
(Pl. X, figs. 7, 8, ♀)

1 ♀, Shigar~Koshumar, W. Pakistan, 22. VI. 1957, Y. YOSHIBA leg.

The female specimen is in the bad condition but possesses recognizable characters of typical *samudra* MOORE.

♀. Upperside of wings dark brown, basal half of both wings rather well clothed with bluish scales. Underside pale grey, forewings with a black discocellular bar, complete series of discal spots which are rather large and situated nearer to outer margin than to discocellular vein, and obscure submarginal markings; hindwing with a small discocellular bar, a subbasal spot and a small discal spot in space 7, and submarginal markings which are covered with bluish scales, the other markings very small and faint.

The species is distributed in the area from Turkestan to China through Persia, Kashmir and Pamir, and, according to EVANS (1932), it is separable into several sub-



**Fig. 13.** Male genitalia of *Polyommatus eros* OCHSENHEIMER subsp.

- A: Lateral aspect of ring and valva.
- B: Inner aspect of right-hand valva.
- B<sub>1</sub>: Outer aspect of apical portion of valva.
- C: Dorsal aspect of dorsum.
- D: Lateral aspect of phallus.
- D<sub>1</sub>: Dorsal aspect of phallus.
- E: Dorsal aspect of dorsum.
- F: Brachium.

species. The present race is known from Gilgit, Baltistan, Kashmir and Ladak.

### Family Danaidae

#### 1. *Limnas chrysippus chrysippus* (LINNÉ, 1758)

1♂ 1♀, Gilgit, W. Pakistan, 24. X. 1957, K. YOSHIBA leg.

1♀, Saidu, W. Pakistan, 10. VII. 1957. K. YOSHIBA leg.

The species is widely distributed in the tropical and subtropical districts from Africa to New Guinea, through Greece, Asia Minor, India, S. China and Malaya.

## Family SATYRIDAE

1. *Kirinia climene alticola* (LE CERF, 1913)

(Pl. XII, figs. 1, 2, ♀)

1♀, Mt. Demavend (1,400 m), Iran, 29. VIII. 1956, S. AZUMA leg.

The yellowish markings on the hindwing upperside are completely obsolete in the Persian race of *climene* ESPER which was originally described from N. Persia. The species is distributed in S. Russia, Armenia and Asia Minor to Persia.

2. *Lasiommata menava menava* MOORE, 1865

(Pl. XII, figs. 3, 4, ♂; text-fig. 17, ♂ genitalia)

1♂ 1♀, Gilgit, W. Pakistan, 24. X. 1957, K. YOSHIBA leg.

The specimens before us from Gilgit are almost identical with *menava* MOORE, except an additional ocellus in space 3 on the forewing upperside in the male.

Male genitalia : Tegumen constricted above appendices angulares, triangular in lateral aspect ; uncus bowed near base, thence tapering apically ; brachia short and straight ; saccus moderately long ; valvae long and narrow, nearly of the same width throughout, with apical portion curving dorsally and acutely pointed ; phallus rather short and stout, subzonal portion shorter than suprazonal one, which bears two pairs of spiny dosal processes and several denticles.

This species is distributed in Persia, Turkestan and Afghanistan to Kashmir,

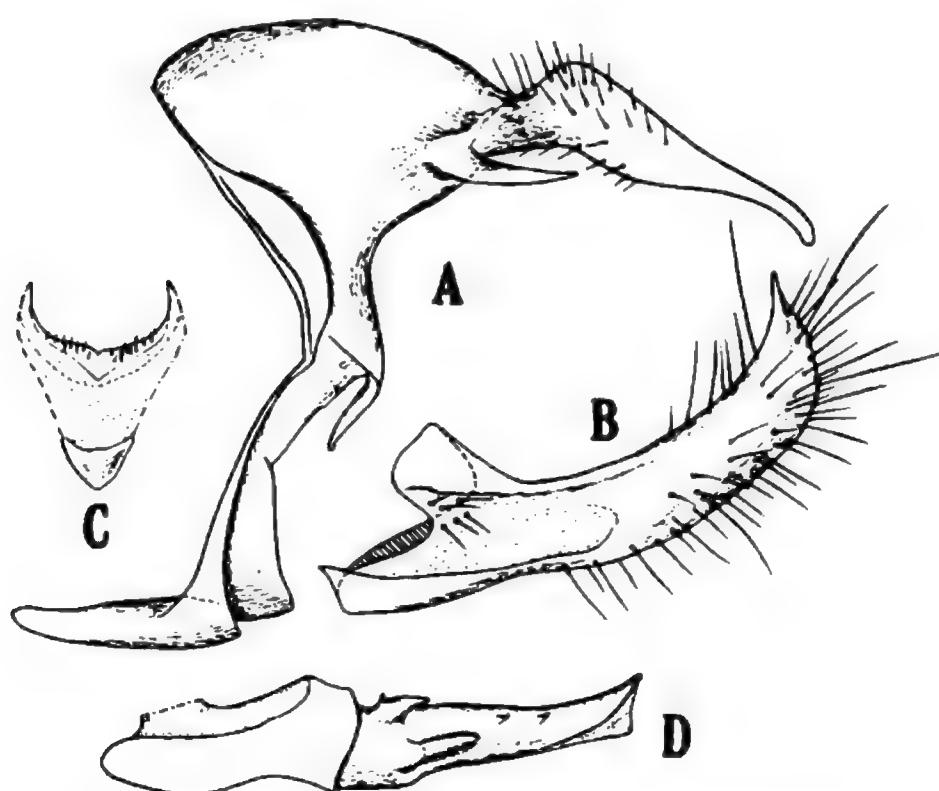


Fig. 17. Male genitalia of *Lasiommata menava menava* MOORE.

A : Lateral aspect of ring.

B : Inner aspect of right-hand valva.

C : Juxta.

D : Lateral aspect of phallus.

and is differentiated into two local races.

### 3. *Aulocera padma padma* (KOLLAR, 1844)

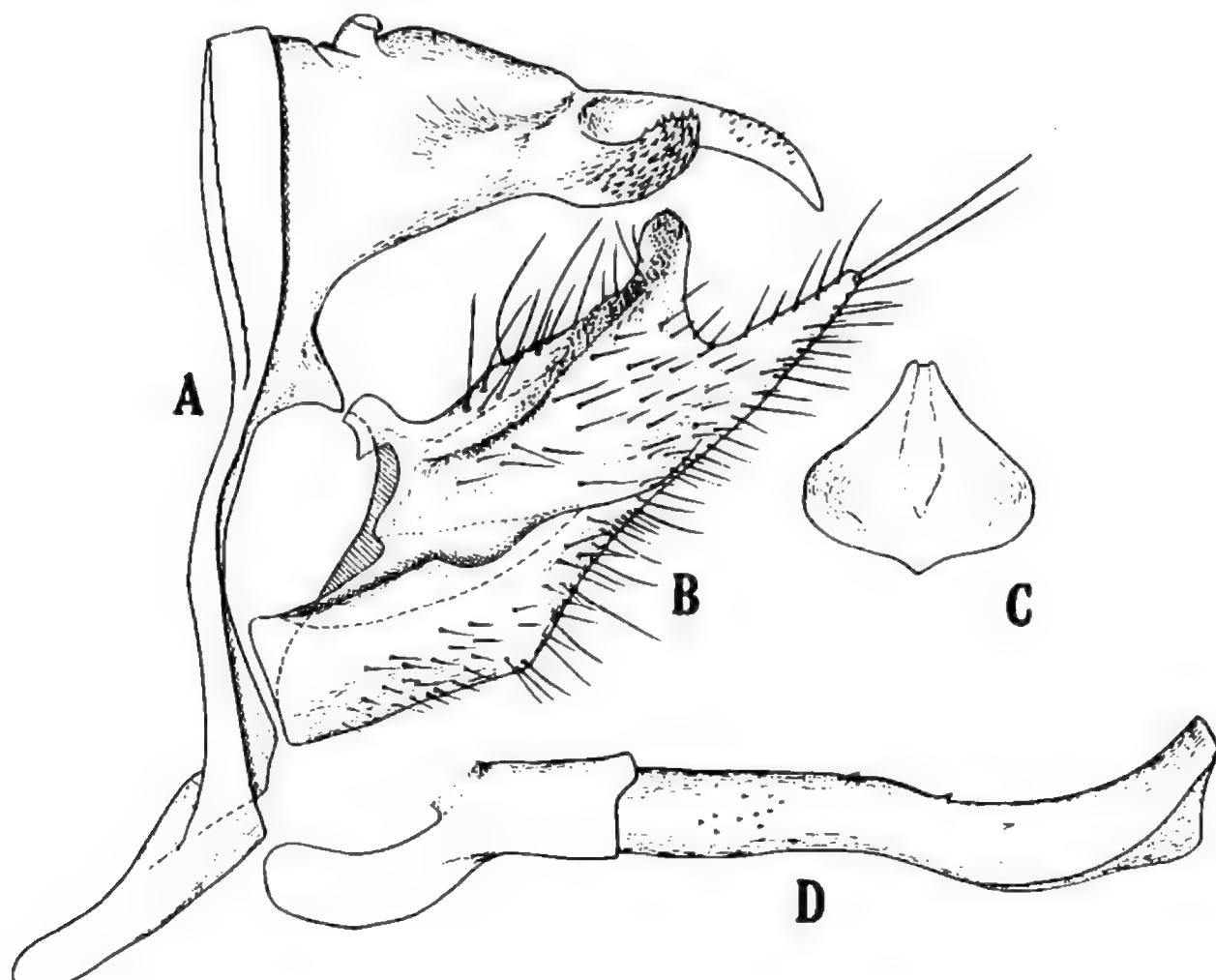
(Pl. XII, figs. 5, 6, ♂; text-fig. 18, ♂ genitalia)

1♂, Nomal~Nalter, W. Pakistan, 9. X. 1957, K. YOSHIBA leg.

In the above-mentioned specimen the median white band on hindwing upper-side is somewhat wider than in the typical *padma* KOLLAR, which is distinguished from subsp. *grandis* TYTLER from Gilgit in its smaller size. Length of forewings of the present specimen is 39 mm.

Male genitalia: Uncus much shorter than tegumen, gently curving ventrally throughout its apical half; brachia short and stout, densely denticulated, and with the blunt apex which does not reach middle of uncus; valvae large, costal band of small denticles well developed from near base of costa to apex of ampullar process which curves dorsally; process of harpe long and straight; phallus long, bisinuate near middle, with several spines on suprazonal portion of aedeagus, coecum long.

This large species of *Aulocera* is distributed in N. W. Himalayas to W. China. According to GROSS (1958), the species consists of three local races, and the nominate one is widely spread from Kulu to Nepal and Sikkim.



**Fig. 18.** Male genitalia of *Aulocera padma padma* KOLLAR.

A: Lateral aspect of ring.

B: Inner aspect of right-hand valva.

C: Juxta.

D: Lateral aspect of phallus.

4. *Aulocera swaha swaha* (KOLLAR, 1844)

(Pl. XII, figs. 7, 8, ♂; text-fig. 19, ♂ genitalia)

1♂, Nazbar Pass (3,400 m), W. Pakistan 10. VII. 1957, G. IWATUBO leg.

1♂, Dumial, W. Pakistan, 7. IX. 1957, K. YOSHIBA leg.

Two male specimens before us are slightly different from each other in the width of white band on the upperside of wings, but these differences may be individual within the nominate race. In the specimen from Nazbar Pass, the width of the band is 2.5 mm in space 6 on hindwings above and the length of forewings is 19 mm; in the specimen from Dumial the band is wider, about 5 mm in space 6 and the length of forewings is 32 mm.

Male genitalia: Uncus as long as tegumen, curving at middle, with its apical half nearly straight and with small hooked apex; brachia long, denticulate near apex, which exceeds middle of uncus; valvae relatively smaller than in the preceding species, minutely denticulated only on posteriorly projecting ampullar process, harpal process short and parallel to ampullar one; phallus long, almost straight, coecum not formed, several spines at middle of suprazonal portion of aedeagus.

This species inhabits Chitral, N. W. Himalayas and Nepal to Sikkim. According to GROSS (1958), the species is separable into five subspecies and the nominate

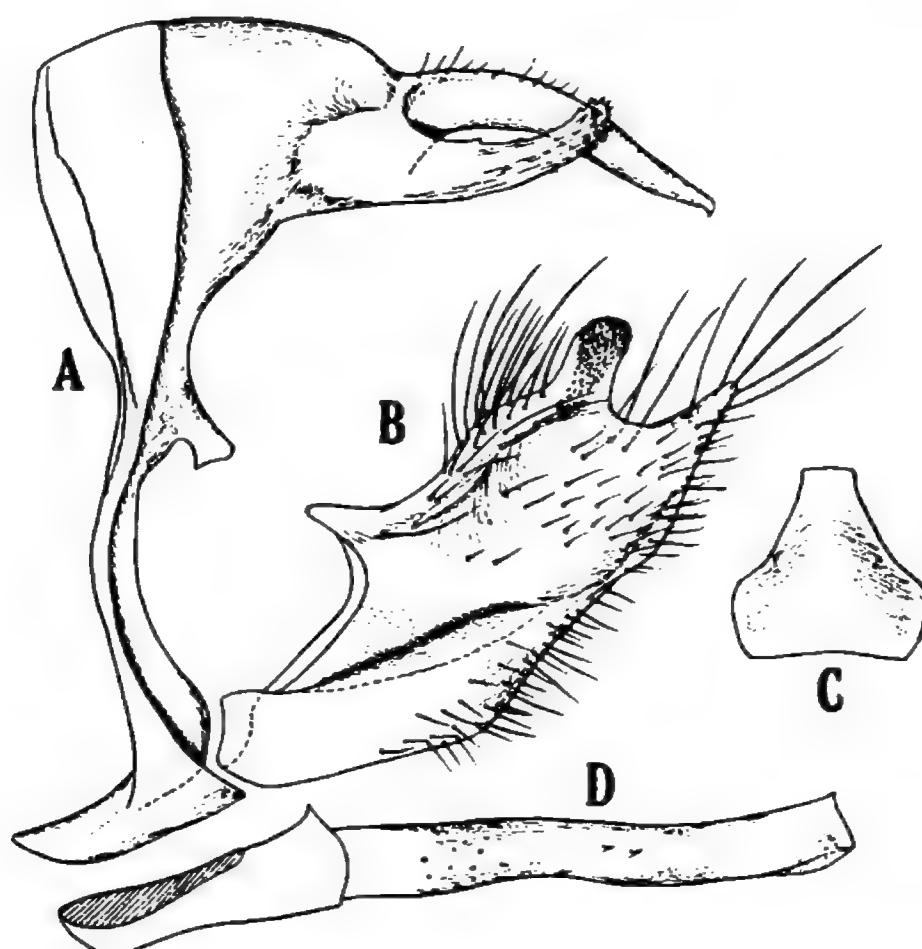


Fig. 19. Male genitalia of *Aulocera swaha swaha* KOLLAR.

A : Lateral aspect of ring.

B : Inner aspect of right-hand valva.

C : Juxta.

D : Lateral aspect of phallus.

form inhabits Kashmir and Chitral.

5. *Hipparchia (Neohipparchia) parisatis parsis* (LE CERF, 1913)

(Pl. XIII, figs. 1, 2, ♂, 3, 4, ♀; text-fig. 20, ♂ genitalia)

1 ♂, Saidu, W. Pakistan, 9. VII. 1957, K. YOSHIBA leg.

1 ♀, Phakos, W. Pakistan, 16. IX. 1957, K. YOSHIBA leg.

In the Indian region, the present species consists of two subspecies, of which the race from Baluchistan, Chitral to Hunza has a prominent white border from dorsum to vein 4 or 5 on forewing upperside, while in another race from Kashmir to Kumaon the white bordering is very obscure. Both the male and the female specimens in the present collection show the typical character of the former race, *parsis* LE CERF.

Male genitalia: Eight abdominal tergum with posterior margin projecting bilaterally and there adorned with dense long spiny processes. Tegumen protruded posteriorly, with long appendices angulares; uncus slightly shorter than tegumen, gently curving ventrally and tapering towards minute hooked apex; brachia arising from the base of uncus, gently tapering apically and slightly curving dorsally, with a sharp apex; saccus very short; valvae moderately large and narrow, costa with a

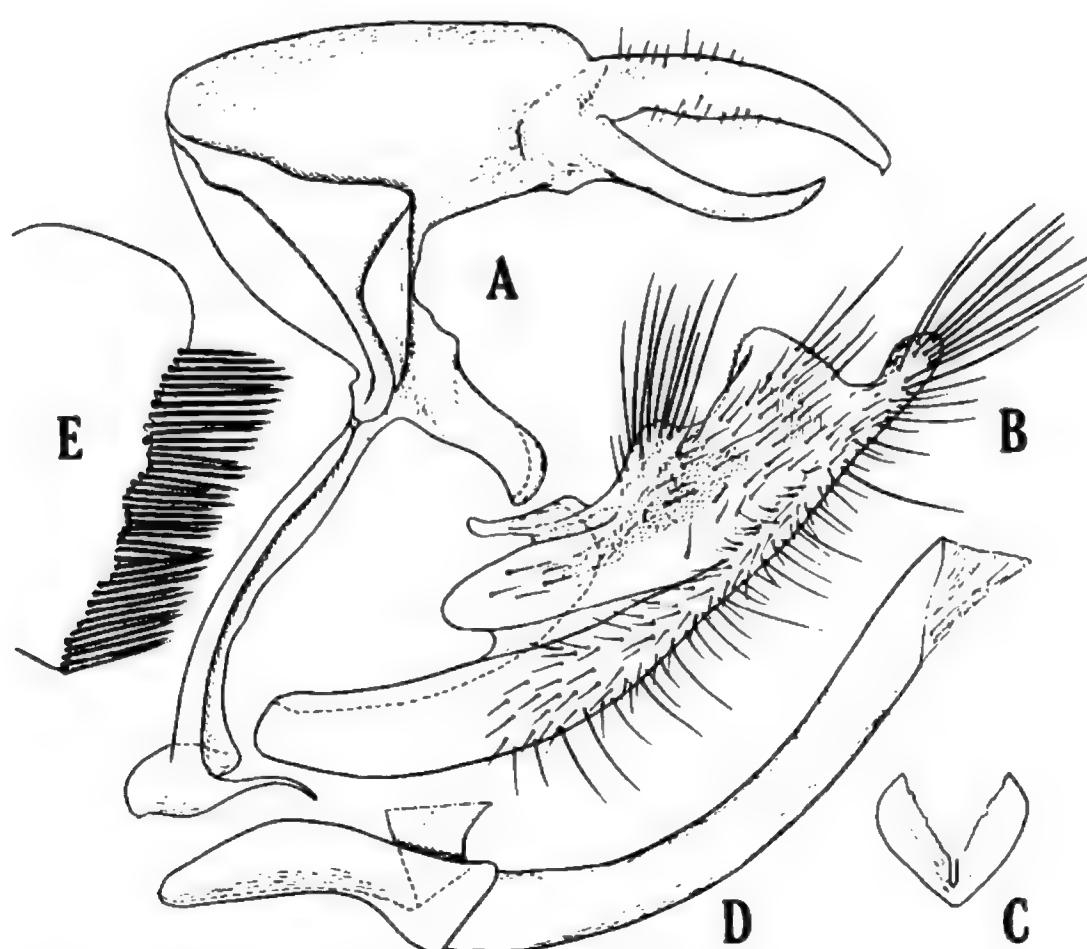


Fig. 20. Male genitalia of *Hipparchia (Neohipparchia) parisatis parsis* LE CERF.

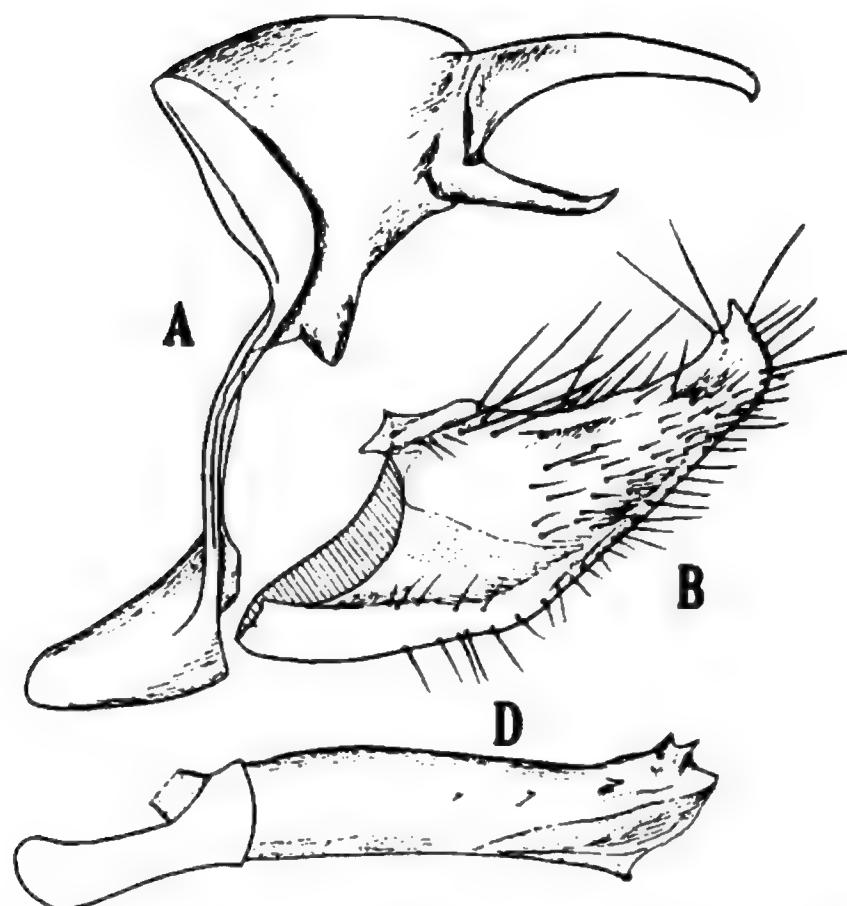
A: Lateral aspect of ring.

B: Inner aspect of right-hand valva.

C: Juxta.

D: Lateral aspect of phallus.

E: Lateral aspect of posterior margin of 8th abdominal tergum.



**Fig. 21.** Male genitalia of *Satyrus actaea parthica* LEDERER.

A : Lateral aspect of ring.

B : Inner aspect of right-hand valva.

D : Lateral aspect of phallus.

middle swelling, dorso-distal corner produced and serrate, ventro-distal portion long projected; phallus long and rather strongly curved, subzonal portion short, spatulate and flattened, suprazonal portion with a short ventral peri-vesical area.

The species is spread in Turkestan, Persia and Pamir to Baluchistan and Kumaon.

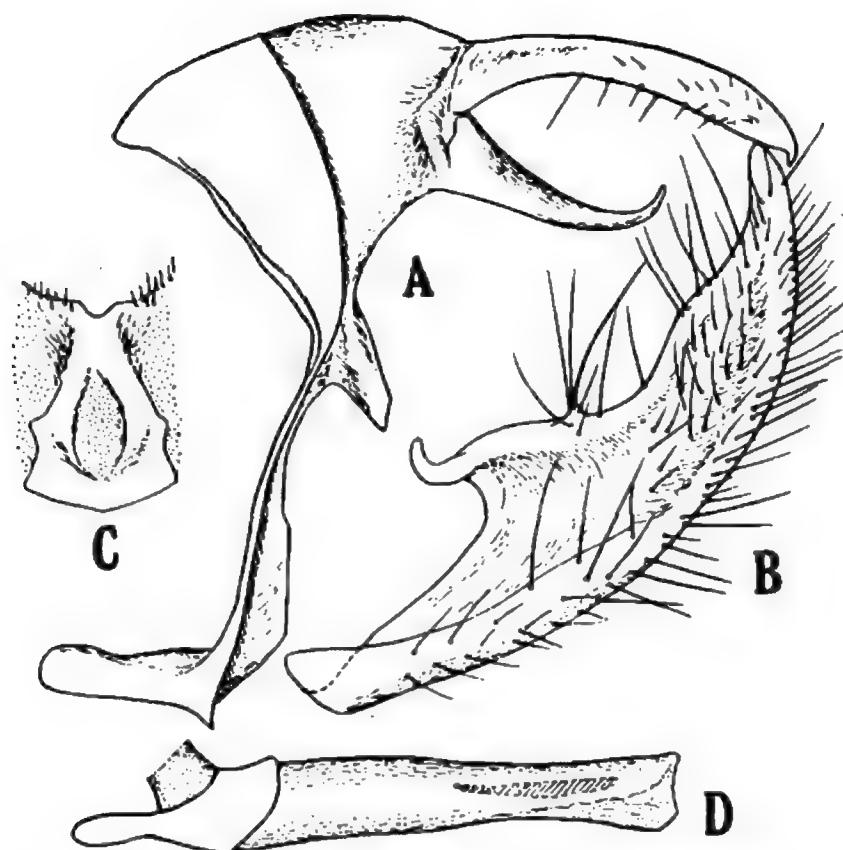
#### 6. *Satyrus actaea parthica* LEDERER, 1869

(Pl. XIII, figs. 5, 6, ♂; text-fig. 21, ♂ genitalia)

1 ♂, Mt. Demavend (3,500–3,800 m), Iran, 30. VII. 1956, S. AZUMA leg.

The specimen from Mt. Demavend may be referable to subsp. *parthica* LEDERER of the well-known European Satyrid, *S. actaea* ESPER. The upperside of forewings is dark brown with a small obscure ocellus which is blackish and distinctly white-pupilled; hindwing upperside is uniformly dark brown. The underside of forewings has ochreous discal area and a large ocellus situated in spaces 4 to 6; hindwings are marked with a rather prominent white postdiscal band. Length of forewings is 26 mm.

Male genitalia : Tegumen triangular in lateral aspect, with short blunt appendices angulares; uncus slightly longer than tegumen, gently curving and tapering towards blunt apex; brachia short, almost straight and tapering towards upturned sharp apex; valvae moderately large, basal portion broad, narrowing towards apex



**Fig. 22.** Male genitalia of *Pseudochazara mniszechii droshica* TYTLER.

- A: Lateral aspect of ring.
- B: Inner aspect of right-hand valva.
- C: Juxta.
- D: Lateral aspect of phallus.

which is sharply pointed and curved dorsally; phallus long and stout, subzonal portion of a half length of suprazonal one, which bears several spiny processes.

The species inhabits Europe and Asia Minor to Persia, Siria, Pamir, Chitral and Baluchistan, and is separated into many subspecies.

#### 7. *Pseudochazara thelephassa* (HÜBNER, 1819-1827)

(Pl. XIII, figs. 7, 8, ♀)

1♀, Mt. Demavend (1,400 m), Iran, 29. VII. 1956, S. AZUMA leg.

The species is distributed in Anterior Asia to Pamir, Afghanistan and Baluchistan.

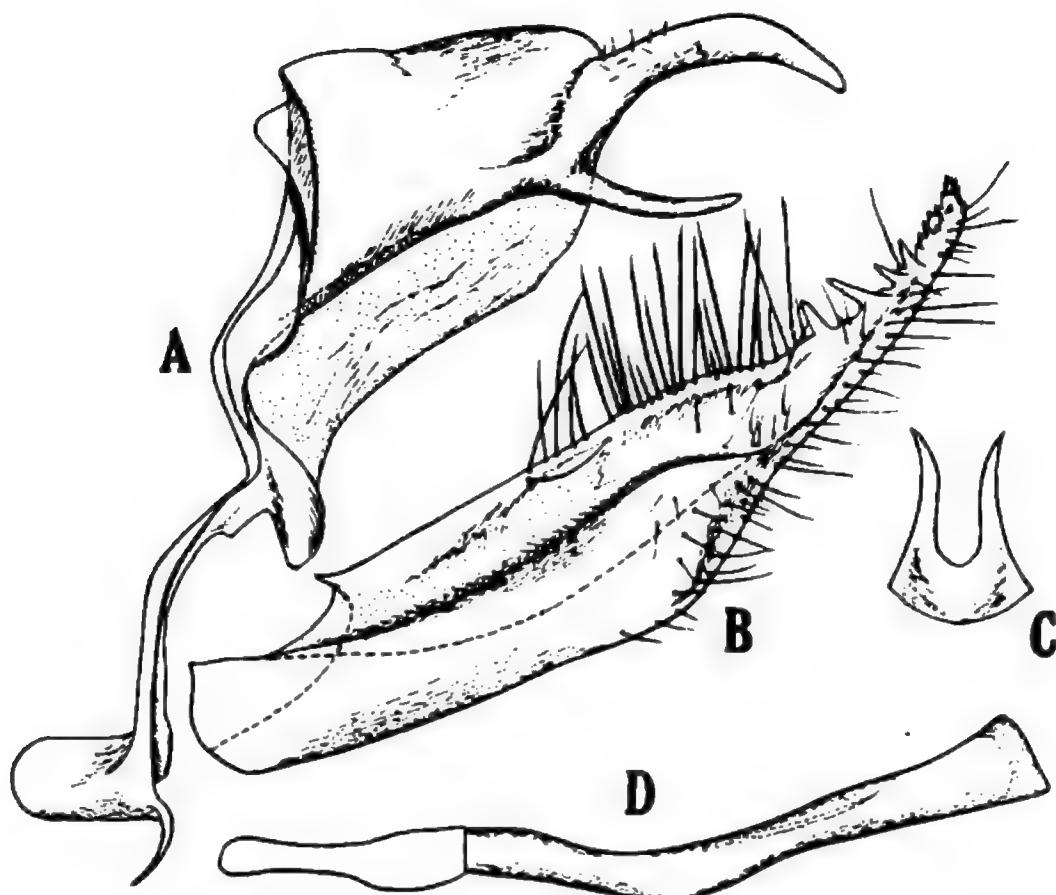
#### 8. *Pseudochazara mniszechii droshica* (TYTLER, 1926)

(Pl. XIV, figs. 1, 2, ♂, 3, 4, ♀; text-fig. 22, ♂ genitalia)

1♂ 1♀, Ghizar, W. Pakistan, 29. VII. 1957, K. OGINO leg.

The specimens from Ghizar are almost identical with subsp. *droshica* TYTLER, of which forewings are marked with the deep ochreous band that contains the preapical ocellus placed near the straight inner edge on upperside. In the present specimens the ocelli on forewing upperside are not white-pupilled.

Male genitalia: Tegumen triangular in lateral aspect; uncus nearly as long as tegumen, gently curving ventrally, almost of the same width throughout in lateral



**Fig. 23.** Male genitalia of *Kanetisa (Kanetisa) digna digna* MARSHALL.

- A : Lateral aspect of ring.
- B : Inner aspect of right-hand valva.
- C : Juxta.
- D : Lateral aspect of phallus.

aspect, and with short hooked apex; brachia long, tapering apically and curving dorsally, with apex exceeding middle of uncus; valvae simple, tapering towards simple acute apex and rather strongly curving dorsally, ventral margin of valvae simple, dorsal margin bisinuate with a haired tubercle at the basal one-third; phallus moderately long, subzonal portion very short, aedeagus with a long ventral peri vesical area, vesica with a weakly sclerotized elongate plate.

The species is distributed in Asia Minor, Turkestan to N. W. Himalayas and W. China, and contains five Indian races. The present subspecies is known from Chitral, Gilgit and Baltistan.

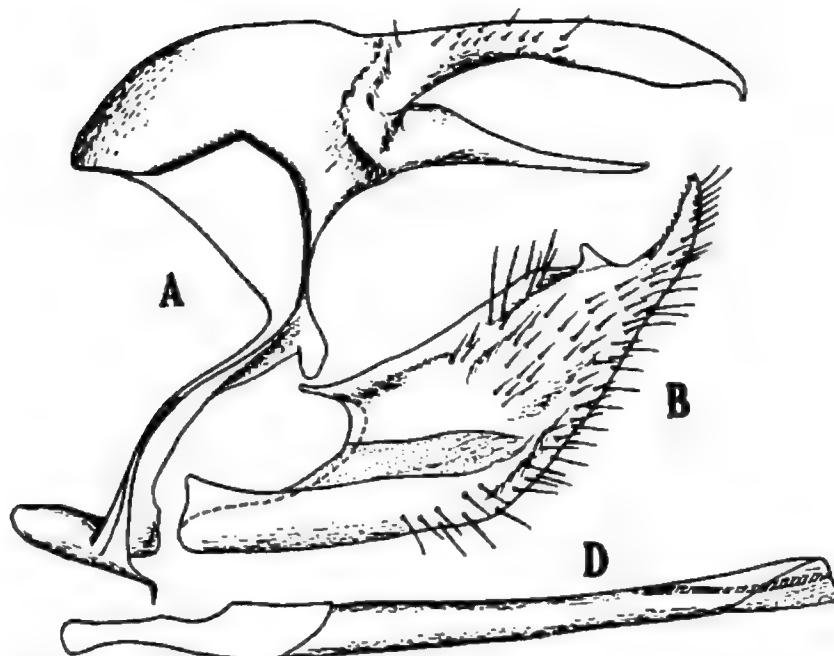
#### 9. *Kanetisa (Kanetisa) digna digna* (MARSHALL, 1882)

(Pl. XIV, figs. 5, 6, ♂, 7, 8, ♀; text-fig. 23, ♂ genitalia)

1 ♂ 1 ♀, Yashin~Batakush, W. Pakistan, 9. VIII. 1957, S. AZUMA leg.

This species superficially resembles *Pseudochazara mniszechii* HERRICH-SCHÄFFER, but is distinguished from the latter by the absence of a black spot in space 2 on forewing upperside. The specimens from Yashin~Batakush are identical with the nominate form, of which the black spot in space 5 on forewing upperside is not entirely enclosed within the ochreous band.

Male genitalia: Tegumen strongly constricted towards appendices angulares on its ventral half; uncus slightly shorter than tegumen, with basal half upturned,



**Fig. 24.** Male genitalia of *Chazara heydenreichi shandura* MARSHALL.

A : Lateral aspect of ring.

B : Inner aspect of right-hand valva.

D : Lateral aspect of phallus.

thence gently curving ventrally at middle; brachia slender and moderately long, with tip slightly exceeding middle of uncus; valvae long and narrow, tapering towards simple apex, costa with long bristly hairs on middle one-third and spiny processes on distal one-third; phallus slender and moderately long, the suprazonal portion of aedeagus flattened and with a longitudinal short depression at middle and ventral peri-vesical area.

The species is restricted to Chitral in its distribution range, and is represented by two subspecies. According to EVANS (1932), the nominate form inhabits the area above 9,000 feet, while the other form, *pallas* EVANS, below 9,000 feet; it is also known from western Gilgit.

#### 10. *Chazara heydenreichi shandura* (MARSHALL, 1882)

(Pl. XV, figs. 3, 4, ♂; text-fig. 24, ♂ genitalia)

1 ♂, Ghizar, W. Pakistan, 29. VII. 1957, K. OGINO leg.

2 ♂♂, Nazbar Pass (3,400 m), W. Pakistan, 10. VIII. 1957, G. IWATUBO leg.

This species is closely related to the next one, but is easily distinguished from that by a white marking in the forewing discoidal cell. The present race is slightly differentiated from the nominate one in the clearer white marking on hindwing upperside.

Male genitalia: Tegumen triangular in lateral aspect with short appendices angulares; saccus short; uncus slightly longer than tegumen, weakly constricted at middle, and with apical half gently curving downwards and rather abruptly tapering towards hooked apex; brachia arising from base of uncus, almost straight and extending posteriorly along uncus, stout at the base, tapering towards pointed apical portion which reaches apical one-fifth of uncus; vinculum nearly as high as tegu-

men; saccus short; valvae moderately large, apical half tapering towards long slender apex which is serrate on the basal margin, a short triangular lamellate projection at the preapical portion of dorsal margin; phallus long and slender, subzonal portion short, aedeagus with a short ventral peri-vesical area, and a long slender sclerite on vesica.

The species contains two local races, of which the nominate one inhabits Central Asia, the Altai, the Tabagatai and Ala-Tau, and subsp. *shandura* MARSHALL is known from Chitral to Kashmir.

#### 11. *Chazara briseis hyrcana* (STAUDINGER, 1886)

(Pl. XV, figs. 1, 2, ♂; text-fig. 25, ♂ genitalia)

3♂♂, Mt. Demavend (1,400 m), Iran, 29. VII. 1956, S. AZUMA leg.

1♀, Maraghe, Iran, 8. X. 1956, S. AZUMA leg.

The male specimens from Mt. Demavend are identical with subsp. *hyrcana* STAUDINGER which has the narrowest white band among the races of *briseis* LINNÉ.

Male genitalia: Almost the same as those of the preceding species; but apical prolongation of valvae more strongly projecting and more densely denticulated than in the preceding species.

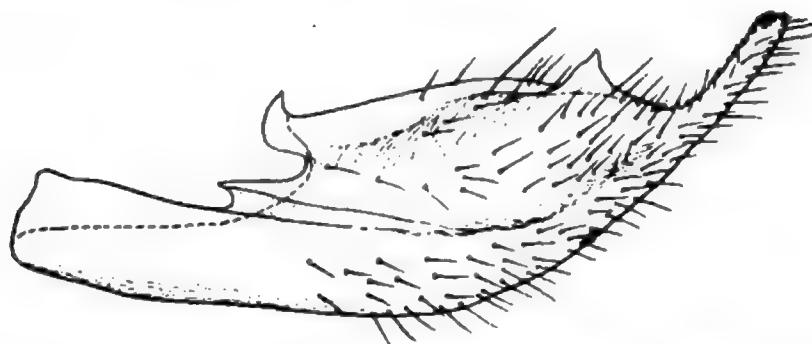


Fig. 25. Inner aspect of right-hand valva of *Chazara briseis hyrcana* STAUDINGER.

The species is distributed in Europe and N. Africa to Anterior Asia, Persia and Pamir. It is separated into several subspecies based mainly on the width of the white band of wings above. The present race is known from Persia and Anterior Asia.

#### 12. *Melanargia galathea* (LINNÉ, 1758) subspecies

(Pl. XV, figs. 5, 6, ♀)

1♀, Mt. Demavend (1,400 m), Iran, 29. VII. 1956, S. AZUMA leg.

A single female specimen before us is considerably different from the nominate race of Europe, especially in a broader white band of the upperside of both wings.

The species is distributed in N. Africa and almost whole Europe extending to Syria and Persia.

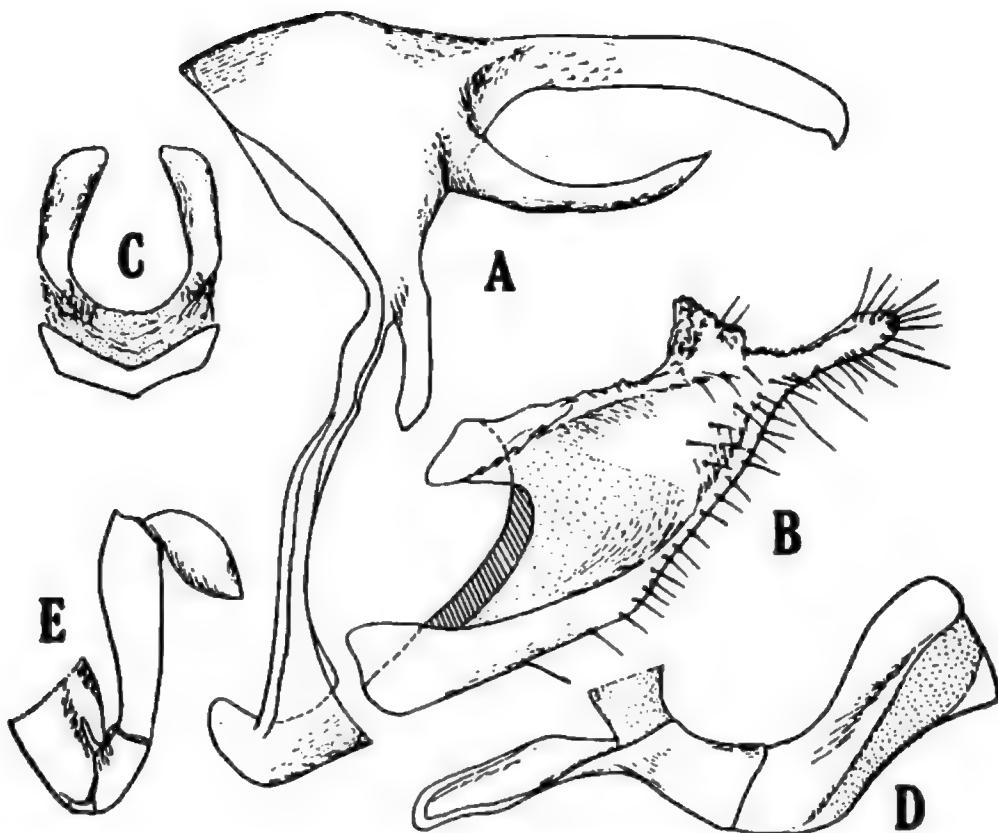


Fig. 26. Male genitalia and front leg of *Callerebia nirmala materta* FRUHSTORFER.

- A: Lateral aspect of ring.
- B: Inner aspect of right-hand valva.
- C: Juxta.
- D: Lateral aspect of phallus.
- E: Front leg, basal portion of coxa omitted.

### 13. *Callerebia nirmala materta* FRUHSTORFER, 1916

(Pl. XV, figs. 7, 8, ♂; text-fig. 26, ♂ genitalia)

2♂♂, Barain, W. Pakistan, 15. VII. 1957, G. IWATUBO leg.

2♂♂, Mochodan, W. Pakistan, 21. VII. 1957, K. OGINO leg.

Upperside of wings dark brown, slightly paler near outer margin on forewings; forewings with a double-pupilled black ocellus which is situated in spaces 4 to 6 and marginated with ochreous brown; hindwings with moderately large ocellus in space 2, which is white-pupilled and ringed with deep ochreous brown. Underside of hindwings with large ochreous brown discal area, the same ocellus as on upperside, of which the ring is more yellowish, and very obscure discal and submarginal bands; underside of hindwings greyish brown, very much suffused grey in the specimens from Mochodan, with obscure brownish discal line, a white dot in each of spaces 4 to 6, and the same ocellus as on upperside.

Male genitalia: Tegumen triangular in lateral aspect, with long, drooped appendices angulares; vinculum higher than tegumen, with a short saccus; uncus nearly one and a half times as long as tegumen, rather stout, slightly curving, and with a hooked apex; brachia long and slender, with acutely pointed apex extending apical one-third of uncus; valvae with basal half of the same width, apical half tapering towards elongate, distal process, dorsal margin of valvae with a denticulated triangular process near base of the distal process; phallus short and somewhat

flattened, and with subzonal portion nearly as long as suprazonal one, which is strongly bent upward near zone, and has ventral peri-vesical area, coecum long and spatulate.

The range of the species is confined to Chitral and N. W. Himalayas. According to TALBOT (1947), there are five subspecies in the Indian region.

14. *Hyponephele pulchra* (C. & R. FELDER, 1867) subspecies.

(Pl. XVI, figs. 1, 2, ♂, 3, 4, ♀; text-fig. 27, ♂ genitalia)

2♂ ♂, Nazbar Pass (3,400 m), W. Pakistan, 10. VIII. 1957, G. IWATUBO leg.

2♂ ♂, Ambezth~Ghizar, W. Pakistan, 26. VII. 1957, G. IWATUBO leg.

1♂, Ghizar, W. Pakistan, 29. VII. 1957, G. IWATUBO leg.

1♂, Saidu Shalif, W. Pakistan, 10. VII. 1957.

This species is distributed in Pamir and Chitral to Kumaon, and is separated into five subspecies by the slight differences. Having no identified specimens of these subspecies to compare with, we cannot determine the subspecific name for the specimens listed above.

♂. Upperside of forewings dark ochreous except dark brown costal and outer marginal areas, space 5 with a moderately large black ocellus, its margin obscure, sexual brand absent; upperside of hindwings uniformly greyish brown, with very obscure ochreous areas in spaces 3 and 4. Underside of forewings yellowish ochreous except brownish grey costal and outer marginal borders, with a white-pupilled black ocellus in space 5, the ocellus enclosed by the yellowish ring which is hardly separable from the ground, an obscure brown discal line from veins 2 to

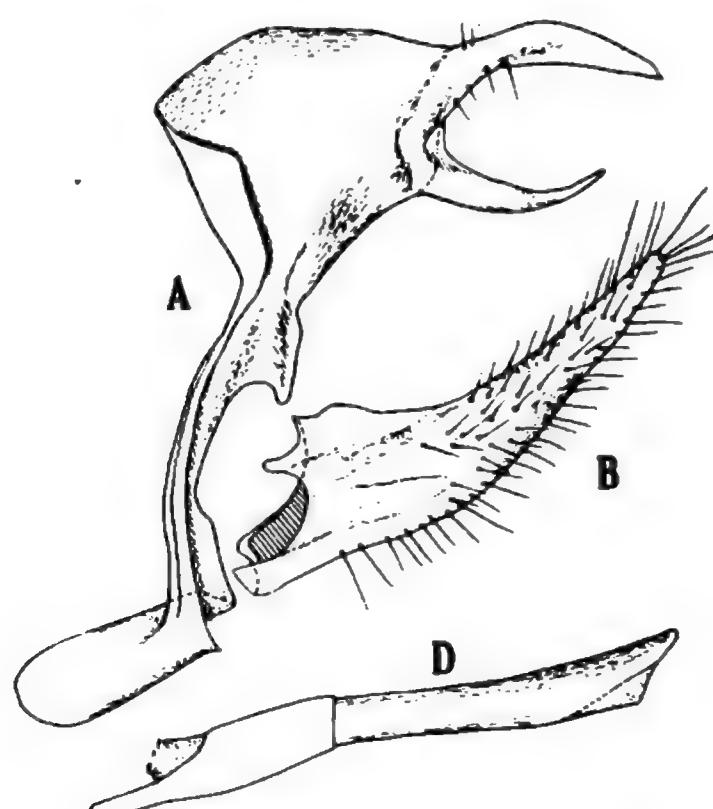


Fig. 27. Male genitalia of *Hyponephele pulchra* C. & R. FELDER subsp.

A: Lateral aspect of ring.

B: Inner aspect of right-hand valva.

D: Lateral aspect of phallus.

7, the line angulary curved in space 3; underside of hindwings brownish grey, striated or speckled with dark brown, and with the obscure subbasal and discal lines which are bordered with obscure ochreous area.

♀. Similar to male. Upperside of forewings with a broad yellowish postdiscal band on dark ochreous ground, the band enclosing a preapical large ocellus and a small ocellus in space 2, the outer marginal border greyish brown.

Length of forewings 20–22 mm in both sexes.

Male genitalia: Tegumen protruded posteriorly, with blunt appendices angulares; uncus much shorter than tegumen, nearly straight, and with acute apex; brachia long, basal portion rather stout, apex acute and ending just before tip of uncus; vinculum lower than tegumen in lateral aspect; saccus rather well developed; valvae moderately long, but not so slender as that of *H. lycaon* ROTTEMBURG; phallus longer than valvae, with subzonal sheath half as long as suprazonal one.

### 15. *Hyponephele davendra* (MOORE, 1865) subspecies.

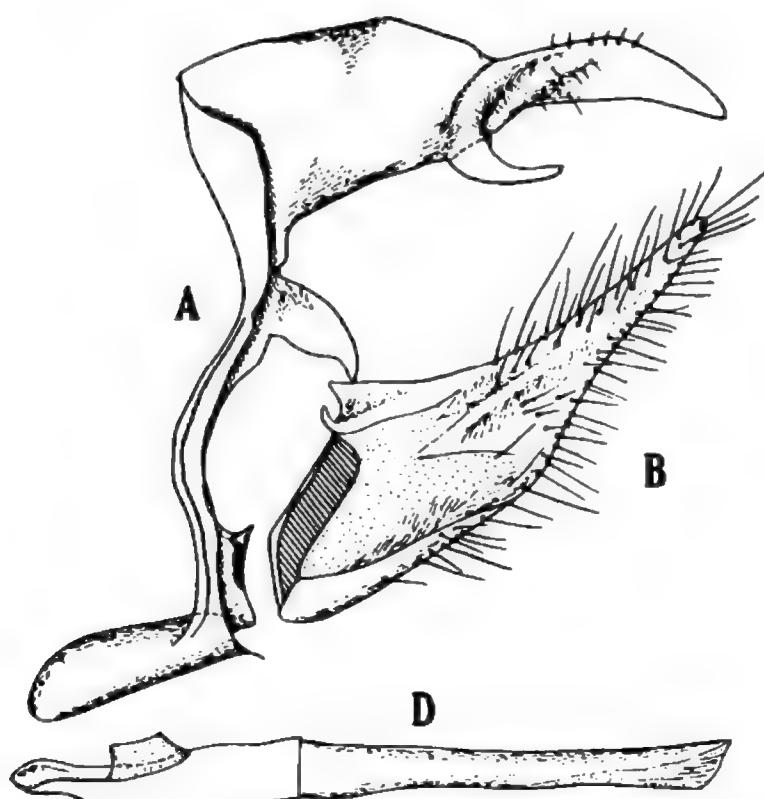
(Pl. XVI, figs. 5, 6, ♂, 7, 8, ♀; text-fig. 28, ♂ genitalia)

1♂, Ghizar, W. Pakistan, 29. VII. 1957, K. OGINO leg.

1♀, Dachmal~Gupis, W. Pakistan, 1. VIII. 1957, G. IWATUBO leg.

1♀, Yashin~Batakush, W. Pakistan, 9. VIII. 1957, G. IWATUBO leg.

The male specimen from Ghizar has the long, narrow brand with its upper tip extending to vein 4 as in subsp. *latistigma* MOORE, but the brand of the present specimen is narrower than in this subspecies.



**Fig. 28.** Male genitalia of *Hyponephele davendra* MOORE subsp.

A: Lateral aspect of ring.

B: Inner aspect of right-hand valva.

D: Lateral aspect of phallus.

♂. Upperside of forewings deep ochreous, costal border greyish brown, outer marginal border rather broad, greyish brown, and with its inner margin produced inwardly along dark veins, a blackish preapical ocellus in space 5 with its diameter equal to the breadth of the space, a greyish brown continuous brand from vein 1 to base of vein 4 along posterior margin of discoidal cell, width of the brand 1 mm in space 2; upperside of hindwings dark greyish brown. Underside as in the typical form. Length of forewings 21 mm.

Male genitalia: Tegumen as long as high, quadrate in lateral aspect, strongly constricted before well-developed appendices angulares; uncus slightly shorter than tegumen, broad, with dorsal margin curving in lateral aspect, and rather blunt apex; brachia short and slightly geniculate, with apex ending before middle of uncus; vinculum nearly as high as tegumen, with a well-developed saccus; valvae moderately large, with basal half broad, thence tapering towards pointed apex; phallus slender and longer than valvae, with subzonal portion nearly as long as two-thirds length of suprazonal one.

The species is distributed in Turkestan and Persia to Baluchistan and Kumaon. According to EVANS (1932), there are four subspecies in the Indian region.

#### 16. *Hyponephele lupinus centralis* (RILEY, 1921)

(Pl. XVII, figs. 1, 2, ♂; text-fig. 29, ♂ genitalia)

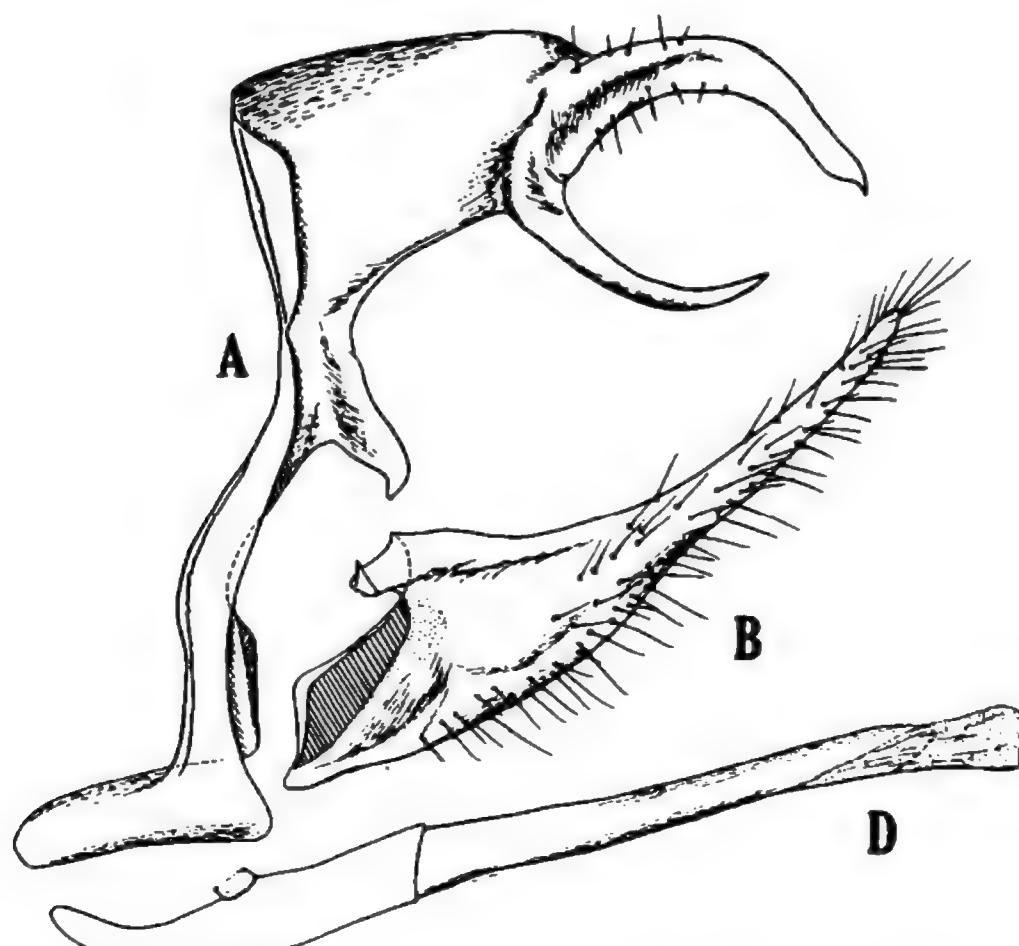


Fig. 29. Male genitalia of *Hyponephele lupinus centralis* RILEY.

A : Lateral aspect of ring.

B : Inner aspect of right-hand valva.

D : Lateral aspect of phallus.

1♂, Mt. Demavend (1,400 m), Iran, 29. VII. 1956, S. AZUMA leg.

The male specimen from Mt. Demavend may be referable to subsp. *centralis* RILEY which inhabits Mesopotamia, N. W. Persia and Baluchistan.

Male genitalia: Tegumen longer than high, quadrate in lateral aspect, strongly constricted before appendices angulares; uncus nearly as long as tegumen, strongly curving downward, with acute apex; brachia long and slender, curving dorsally, the apex extending just before apex of uncus; vinculum as high as tegumen in lateral aspect; valvae with basal portion rather broad, thence tapering towards apex; phallus longer than valvae, with subzonal portion as long as a half length of suprazonal one.

The species is distributed in S. Europe to Chitral, Kashmir and Baluchistan. It is differentiated into several subspecies.

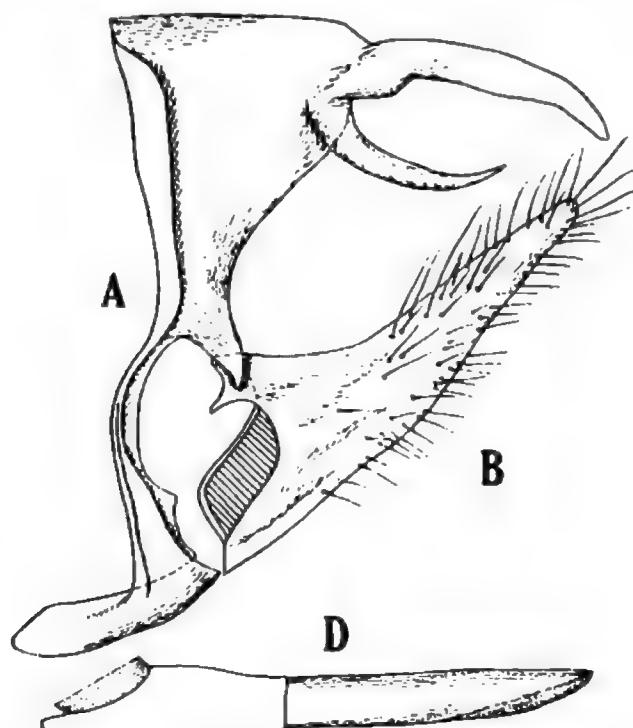
#### 17. *Hyponephele amardaea amardaea* (LEDERER, 1869)

(Pl. XVII, figs. 3, 4, ♂; text-fig. 30, ♂ genitalia)

1♂, Mt. Demavend (3,500–3,800 m), Iran, 30. VII. 1956, S. AZUMA leg.

The male specimen from Mt. Demavend must be *H. amardaea* LEDERER, which is originally described from Persia. The insect superficially resembles the small individual of *H. lycaon* ROTTEMBURG, but the termen of forewings is more strongly rounded and underside of wings with the prominent deep brown subbasal, discal and submarginal lines. Length of forewings is 18 mm.

Male genitalia: Tegumen higher than long, with dorsal margin straight and lower half not strongly constricted near appendices angulares which are moderately



**Fig. 30.** Male genitalia of *Hyponephele amardaea amardaea* LEDERER.

A: Lateral aspect of ring.

B: Inner aspect of right-hand valva.

D: Lateral aspect of phallus.

large; uncus nearly as long as tegumen, tapered near blunt tip, and almost straight; brachia long and curving, with acute apex reaching apical one-third of uncus; valvae with broad base, gently tapering towards pointed apex; phallus nearly as long as valvae, stout, and with subzonal portion more than a half length of the suprazonal one.

The species occurs in Persia, Buchara and Ferghana.

18. *Hyponephele cadusia cadusia* (LEDERER, 1869)

(Pl. XVII, figs. 5, 6, ♂; text-fig. 31, ♂ genitalia)

1♂, Valley near Gazonné (1,300 m), Mt. Demavend, Iran, 1956, S. AZUMA leg.

A single male specimen collected at Gazonné may be referable to *cadusia* LEDERER which was described from Persia.

♂. Small species; upperside of forewings ochreous, with costa and termen broadly greyish brown, a dark ocellus in space 5 placed near inner edge of terminal border, the ocellus not white-pupilled, space 1 and discoidal cell ochreous brown, and with a brownish sexual brand from dorsum to base of vein 4, the brand tapering towards vein 4; hindwing above uniformly greyish brown. Underside of wings as in *H. lycaon* ROTTEMBURG, hindwings with the much more prominent, zigzag, postdiscal line, which is broadly bordered with pale colour. Length of forewings 19 mm.

Male genitalia: Tegumen higher than long, triangular and lower half not strong-

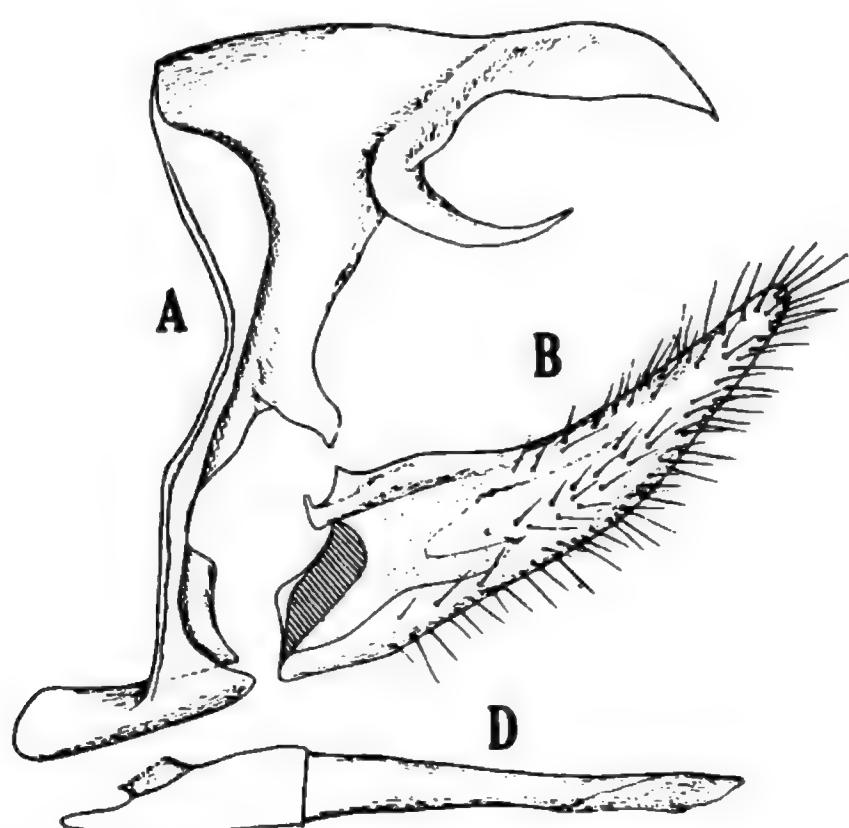


Fig. 31. Male genitalia of *Hyponephele cadusia cadusia* LEDERER.

A: Lateral aspect of ring.

B: Inner aspect of right-hand valva.

D: Lateral aspect of phallus.

ly constricted before appendices angulares in lateral aspect, with dorsal margin almost straight; uncus slightly shorter than tegumen, broad and tapering towards acute apex, its ventral margin straight; brachia moderately long and slender, tapering towards acute apex which extends middle of uncus; vinculum slightly lower than tegumen; valvae moderately long and narrow, but never so slender as those of the other species, with basal half almost of the same width, thence gently tapered towards rounded apex; phallus slightly shorter than valvae, with subzonal portion as long as two-thirds length of slender suprazonal one.

The present species inhabits Persia and Turkestan to Samarkand, and is separated into four subspecies.

#### 19. *Hyponephele lycaon collina* (RÖBER, 1897)

(Pl. XVII, figs. 7, 8, ♂; text-fig. 32, ♂ genitalia)

2♂♂, Mt. Demavend (3,500–3,800 m), Iran, 30. VII. 1956, S. AZUMA leg.

This species very closely resembles *H. lycaon intermedia* STAUDINGER, from which it is distinguished by the smaller size, the narrower and paler sexual brand, obscure ochreous postdiscal area in spaces 2 to 3 or 4 on forewing upperside and the more yellowish ground of forewing underside, besides some structures of the male genitalia. Length of forewings is 20.5–22 mm.

Male genitalia: Tegumen higher than long, its lower half tapered; uncus longer than tegumen, almost straight and bluntly ended; brachia short and slender,

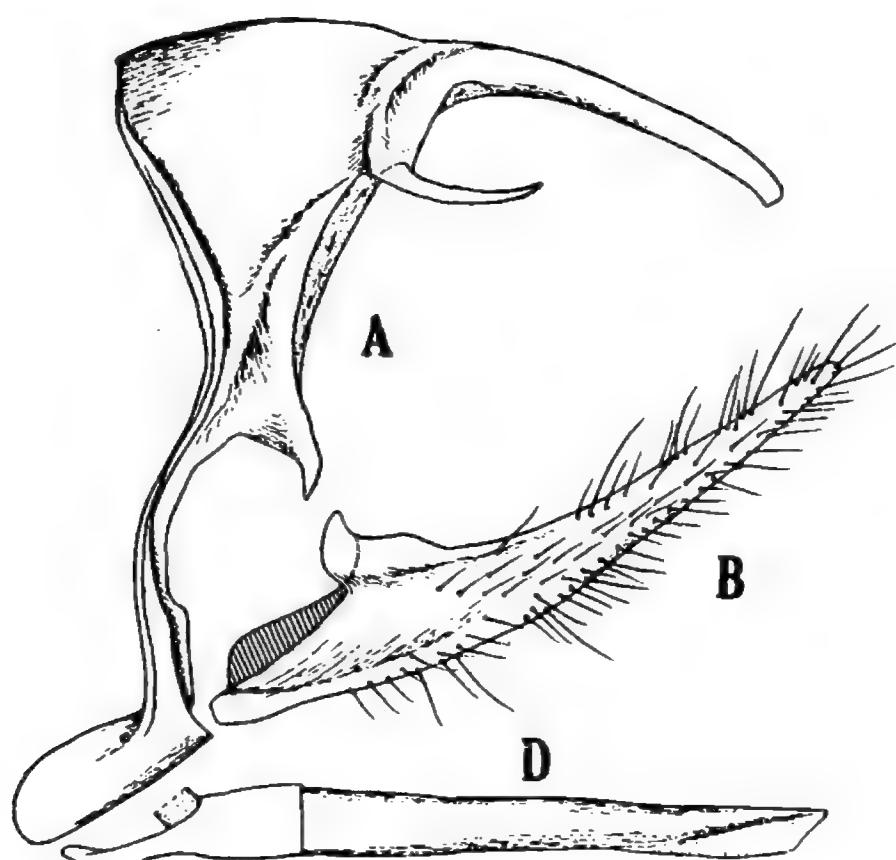


Fig. 32. Male genitalia of *Hyponephele lycaon collina* RÖBER.

A: Lateral aspect of ring.

B: Inner aspect of right-hand valva.

D: Lateral aspect of phallus.

slightly curving, with acute apex ending before middle of uncus; vinculum lower than tegumen in lateral aspect; valvae long and slender, gently tapering; phallus nearly as long as valvae, with subzonal portion shorter than half length of suprzanal one.

This species has a wide range of distribution in the Palaearctic Region from N. Africa and Europe to Amur in the east, and reaches the high mountain areas of Iraq and Persia in the south.

### Family NYMPHALIDAE

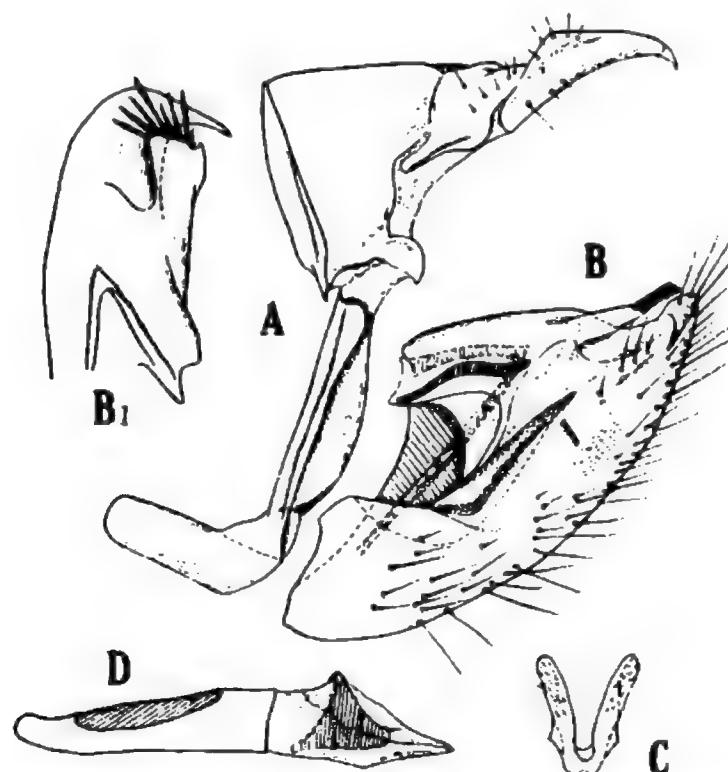
#### 1. *Clossiana jerdoni chitralensis* (MOORE, 1900)

(Pl. XI, figs. 1, 2, ♂, 3, 4, ♀; text-fig. 14, ♂ genitalia)

4♂ 3♀ 1♀, Tikatoki~Diwan Gal (3,400 m), W. Pakistan, 23. VII. 1957, G. IWATUBO leg.

The above-mentioned specimens before us are identical with subsp. *chitralensis* MOORE originally described from Chitral and N. Kashmir. Length of forewings is 18–19 mm (♂) and 20.5 mm (♀).

Male genitalia: Any element of gnathos obsolete; uncus short-bifid at apex; a process of harpe not exceeding apex of the hooked process of ampulla; vesica with a pair of weakly sclerotized simple sclerites.



**Fig. 14.** Male genitalia of *Clossiana jerdoni chitralensis* MOORE.

- A: Lateral aspect of ring.
- B: Inner aspect of right-hand valva.
- B<sub>1</sub>: Dorsal aspect of apical half of valva.
- C: Juxta.
- D: Lateral aspect of phallus.

The distribution range of the species is restricted to Kashmir and Chitral. The species seems to be common in the elevations between 6,500 and 8,500 feet. The species consists of only two local races, and the nominate one is known from Kashmir.

## 2. *Mesoacidalia charlotta vitatha* (MOORE, 1874)

1♂, Ambezth~Ghizar, W. Pakistan, 26. VII. 1956, G. IWATUBO leg.

2♂♂, Nazbar Pass (3,400 m), W. Pakistan, 10. VIII. 1957, G. IWATUBO and K. OGINO leg.

1♀, Vicinity of Dumial (3,700 m), W. Pakistan 8. IX. 1957, K. YOSHIBA leg.

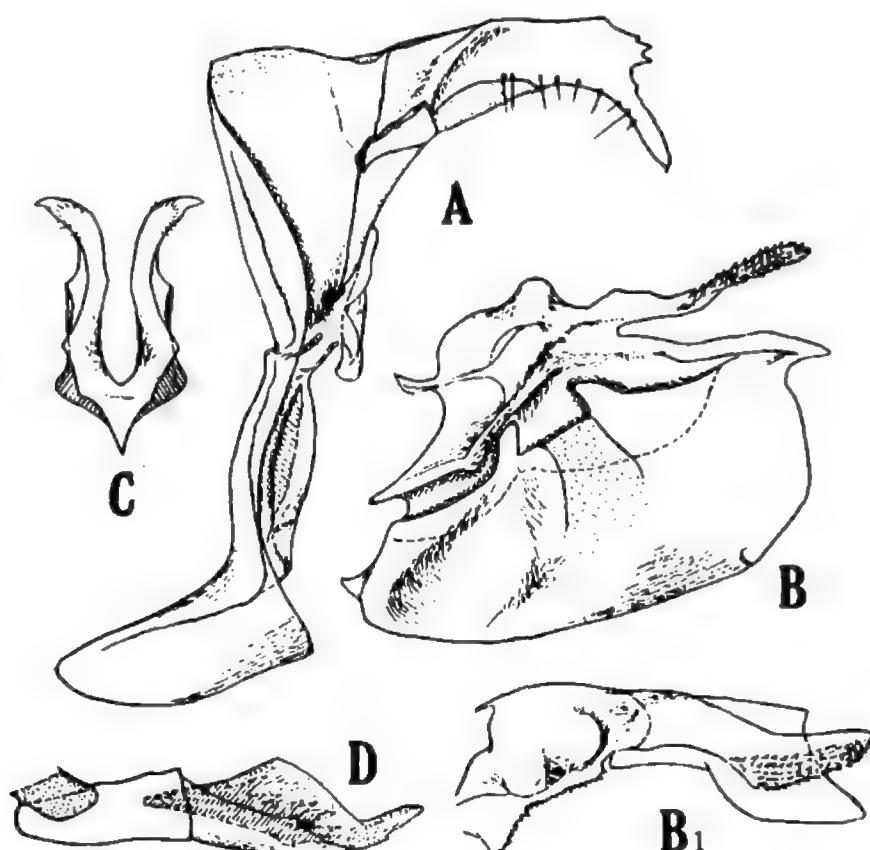
1♀, Baj Gaz Ann, W. Pakistan 13. IX. 1957, K. YOSHIBA leg.

1♀, The Phakos valley, W. Pakistan, 14. IX. 1957, K. YOSHIBA leg.

The above-mentioned specimens, most of which were collected at the high elevations above 3,000 m, are referred to the alpine race of Indian *charlotta* HAWORTH. They show a slight individual variations on the ground colour and the size of silvery spots on hindwings beneath. The male genitalia of these specimens are almost identical with those of the European and Japanese races of *M. charlotta* HAWORTH.

## 3. *Fabriciana niobe jainadeva* (MOORE, 1864)

(Pl. XI, figs. 5, 6, ♂; text-fig. 15, ♂ genitalia)



**Fig. 15.** Male genitalia of *Fabriciana niobe jainadeva* MOORE.

A: Lateral aspect of ring.

B: Inner aspect of right-hand valva.

B<sub>1</sub>: Dorsal aspect of valva.

C: Juxta.

D: Lateral aspect of phallus.

1♂, Mochodan~Tikatoki, W. Pakistan, 22. VII. 1957, G. IWATUBO leg.

A male specimen from the above-mentioned locality is almost identical with *jainadeva* MOORE, but regarding the markings of hindwings it is slightly different from MOORE's *jainadeva* illustrated in his "Lep. Indica, 4".

Male genitalia: Preapical projection of uncus resembling that in *F. niobe* LINNÉ; *F. adippe* DENIS & SCHIFFERMÜLLER and *F. elisa* GODART, formed of three equally large dentations, two small denticles between the preapical projection and the tip of uncus; valvae almost the same as the nominate *niobe*, much broader and shorter than in *adippe*, free process of ampulla nearly straight in lateral aspect, broad and slightly sinuating at middle in dorsal aspect, and the curving portion slightly bowed inwardly, apex of a process of sacculus with denticulated blunt head, inner process of harpe rather pointed; free branches of juxta with preapical portion weakly swollen, but devoid of any prominent denticles; vesica with a pair of lamellae near its opening, left-hand one larger, and with several strong spiny processes, right-hand one smaller and minutely denticulated.

The species is widely spread over Europe and N. Asia, and is separated into many subspecies.

#### 4. *Pandoriana pandra pandra* (DENIS & SCHIFFERMÜLLER, 1775)

1♀, Mt. Demavend, (1,400 m), Iran, 29. VII. 1956, S. AZUMA leg.

The species is distributed in N. Africa, S. Europe, Austria-Hungary, Asia Minor to Tian-shan, Chitral and Gilgit.

#### 5. *Argyreus hyperbius hyperbius* (LINNÉ, 1758)

1♀, Saidu Shalif, W. Pakistan, 9. VII. 1957, G. IWATUBO leg.

The species is widely distributed in the Oriental Region extending to the south of the Palaearctic Region. It is also known from Australia and Abyssinia.

#### 6. *Melitaea didyma mixta* (EVANS, 1912)

(Pl. XI, figs. 7, 8, ♂; text-fig. 16, ♂ genitalia)

1♂, Gupis~Batakush, W. Pakistan, 9. VIII. 1957, K. YOSHIBA leg.

The single male specimen may be referred to subsp. *mixta* EVANS.

♂. Upperside of wings reddish orange, both fore- and hindwings with broad border and crescent-shaped submarginal markings; forewings with a postdiscal band only in spaces 6 to 8, discal markings forming a continuous band in space 4 to costa, and an isolated rounded spot in each of spaces 1b+c to 3, discal spot in space 2 shifted in, discoidal cell with an apical and a constricted median circular markings and a basal black spot, space 1 with a 8-shaped marking and a small black bar near base; hindwings without discal and postdiscal markings, the basal portion blackish, with an obscure median band and a circular cell-end marking. Underside of forewings with more reduced markings than on upperside; underside of

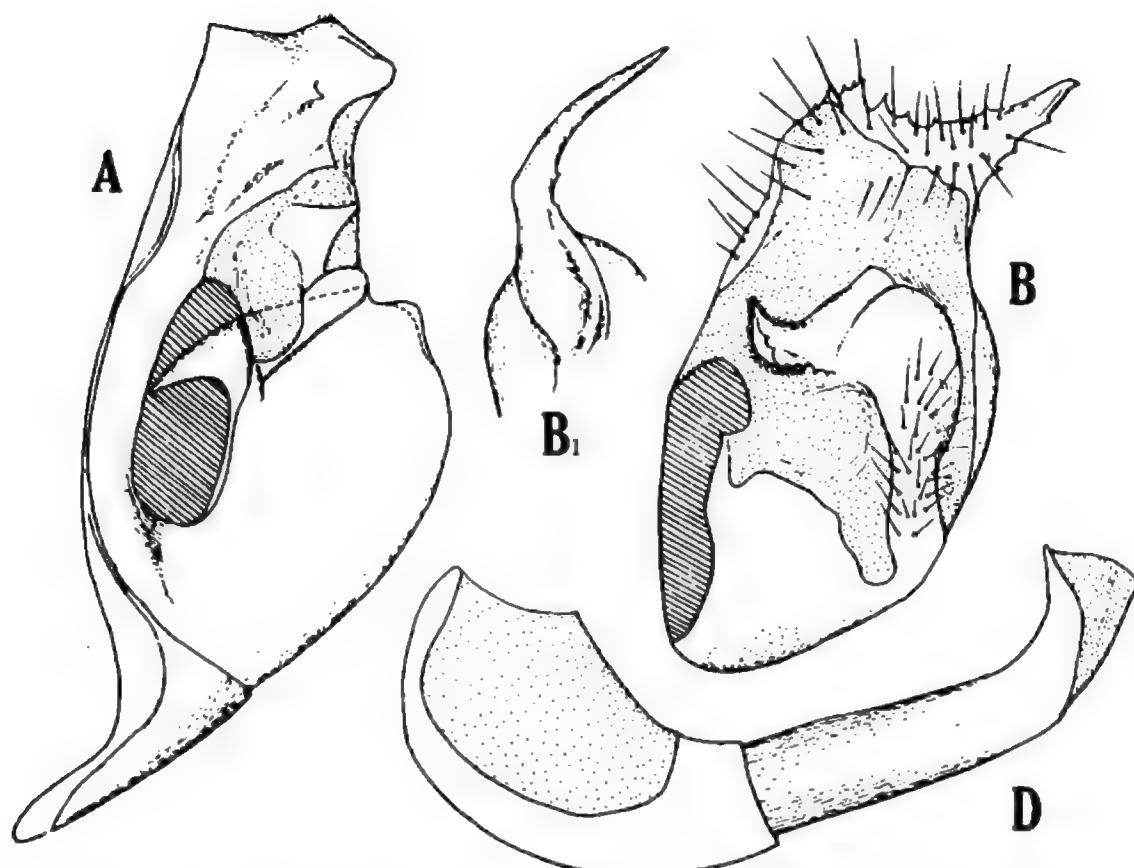


Fig. 16. Male genitalia of *Melitaea didyma mixta* EVANS.

A: Lateral aspect of ring with juxta.

B: Inner aspect of right-hand valva.

B<sub>1</sub>: Dorsal aspect of apical process of valva.

D: Lateral aspect of phallus.

hindwings with a cell-end, a median and a postdiscal orange bands on yellowish ground, the former two jointed with each other, discal markings on yellowish ground small and spot-like, the postdiscal reddish band with bar-shaped postdiscal markings at the inner edge and inwardly concave submarginal markings at the outer edge, submarginal rounded spots prominent.

Male genitalia: Each socius with a basal small tubercle; valvae with a long, incurved process of ampulla and a rather long dentate process of sacculus, the apical margin of valvae serrate; phallus long, simple and curved near apex.

The species has a wide distribution in the Palaearctic Region, and subsp. *mixta* EVANS inhabits Chitral.

#### 7. *Aglais urticae cashmirensis* (KOLLAR, 1844)

1♂, Darkot~Balkulti, W. Pakistan, 10. X. 1957, K. YOSHIBA leg.

The above-mentioned male specimen has hindwings above with the submarginal row of blue-centred black spots inwardly fuscous bordered, the fuscous border narrower than tawny area in spaces 2 and 3.

The species is widely spread from Europe to Asia; the present race is confined to N. Waziristan, Safed Koh and Chitral to Kulu.

# EXPLANATION OF PLATES

## **PLATE I**

*Carcharodus alceue* (ESPER, 1780)

1 & 2, ♂ (*insolatrix*) ; 3 & 4, ♀ (*gooraisa*)

*Pyrgus alpinus alpinus* (ERSCHOFF, 1874)

5 & 6, ♂ ; 7 & 8, ♀



1



2



3



4



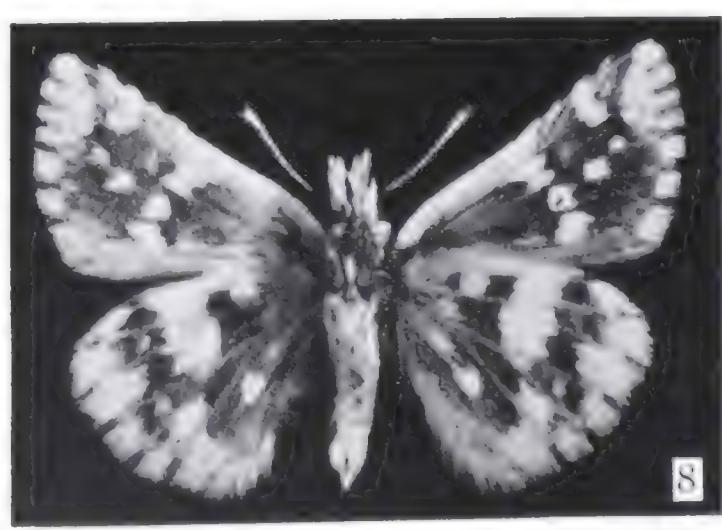
5



6



7



8

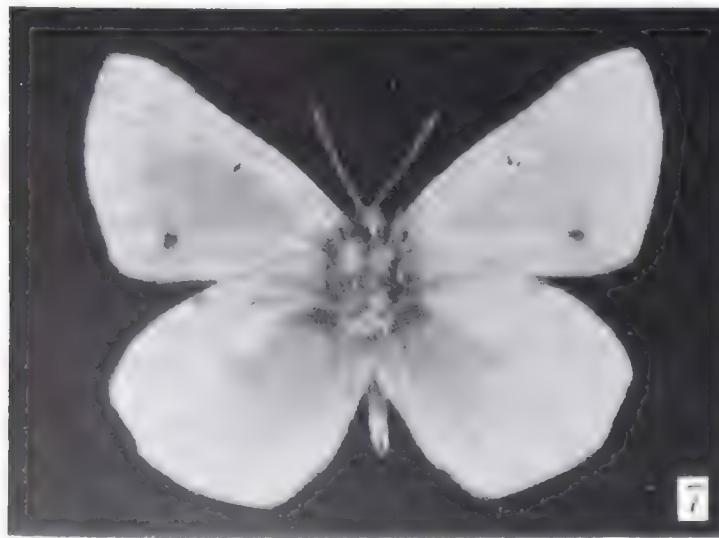
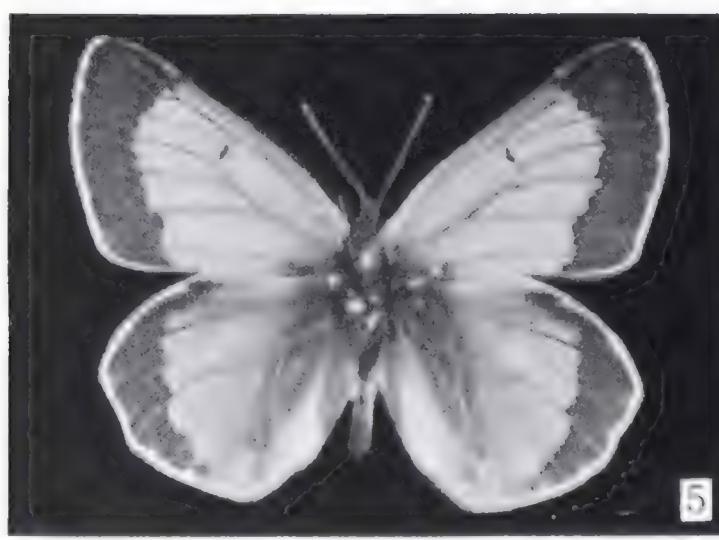
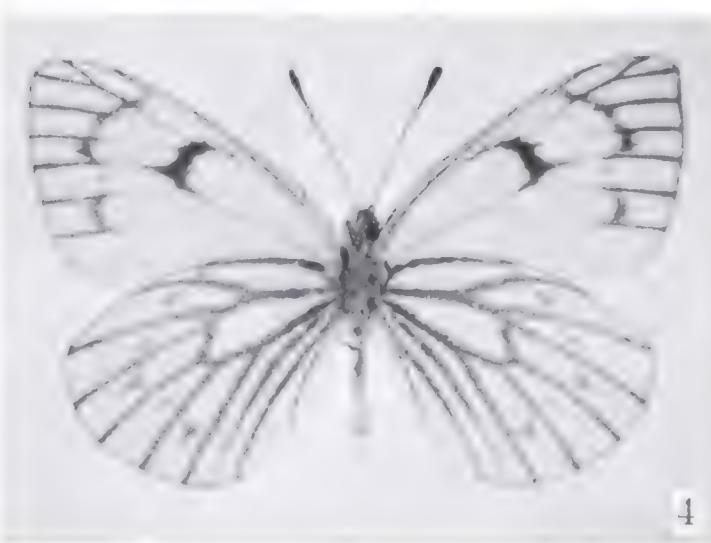
## **PLATE II**

*Ochlodes venata hercana* (CRISTOPH, 1893), 1 & 2, ♀

*Aporia leucodice balucha* MARSHALL, 1882, 3 & 4, ♂

*Colias eogene shandura* EVANS, 1926, 5 & 7 ♂, 6 ♀

*Colias erate erate* (ESPER, 1805), 8, ♂

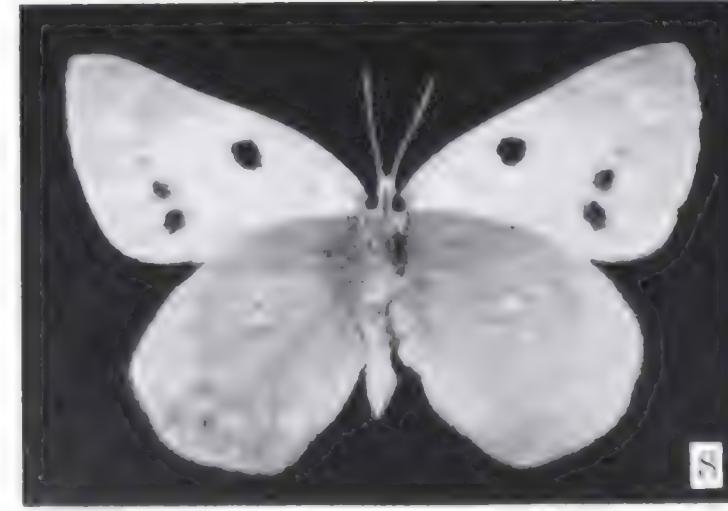
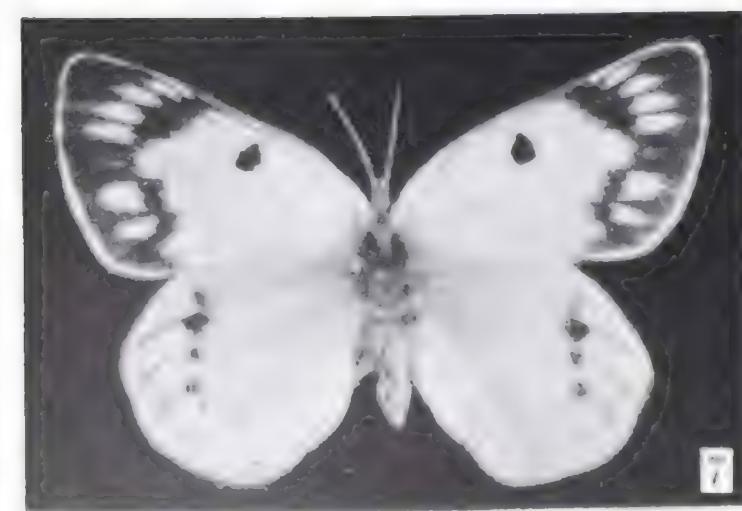
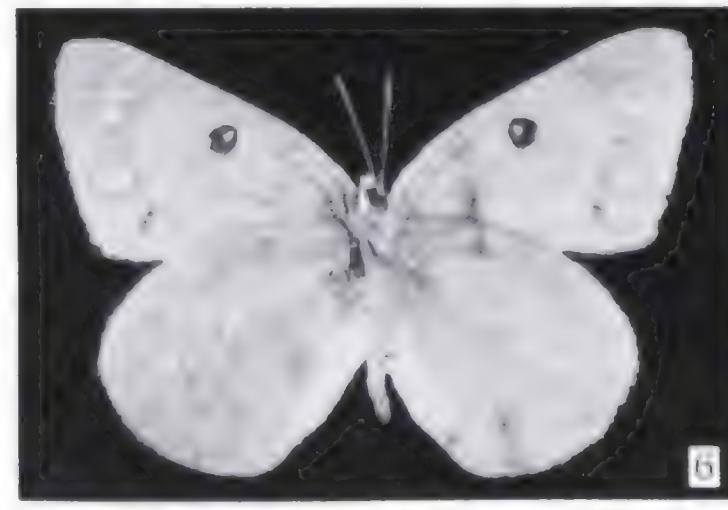
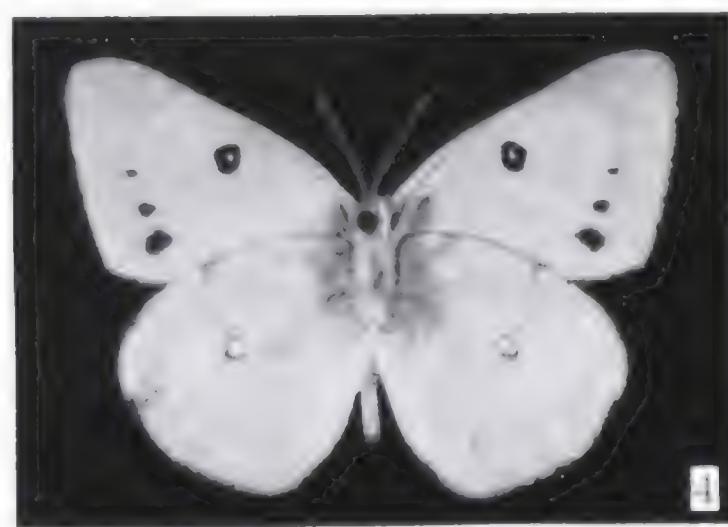
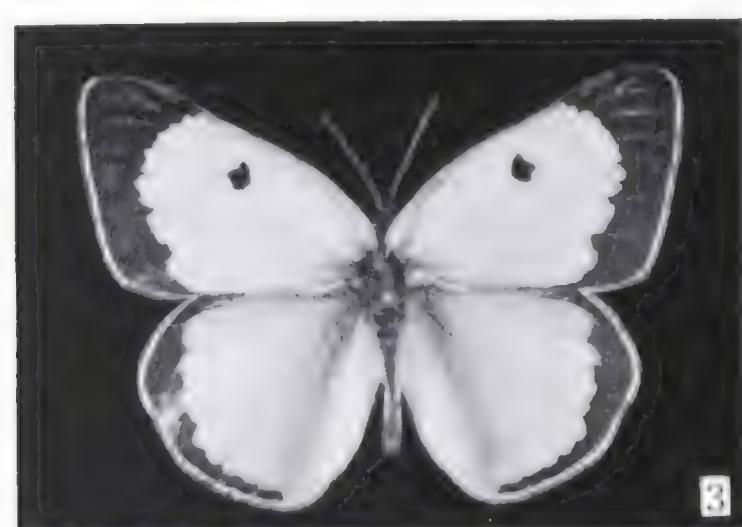
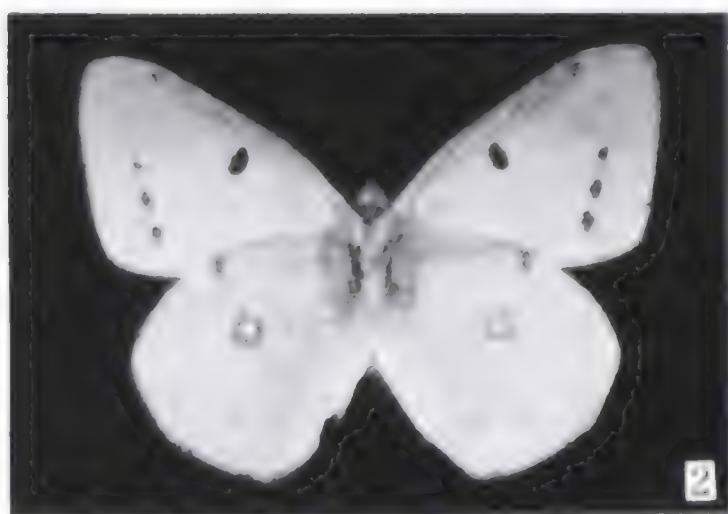
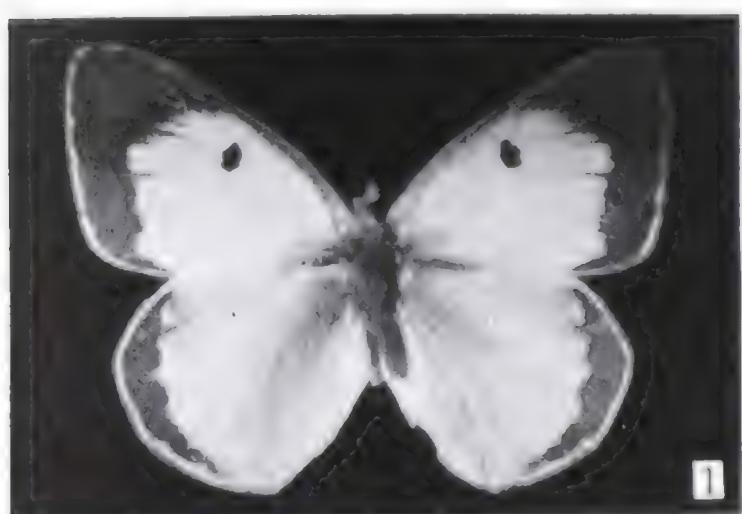


### **PLATE III**

*Colias erate erate* (ESPER, 1805), 1 & 2, ♂

*Colias erecto fieldi* MÉNÉTRIÈS, 1855, 3 & 4, ♂ ; 5 & 6, ♀

*Colias alpherakyi chitralensis* VERITY, 1911, 7 & 8, ♀

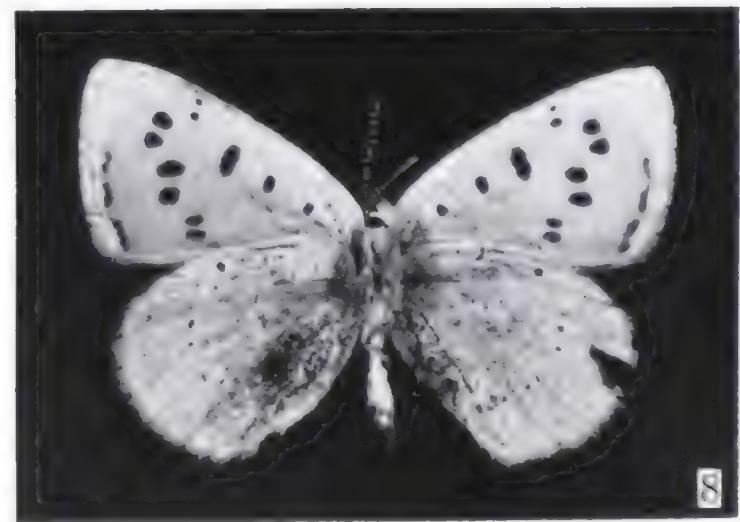
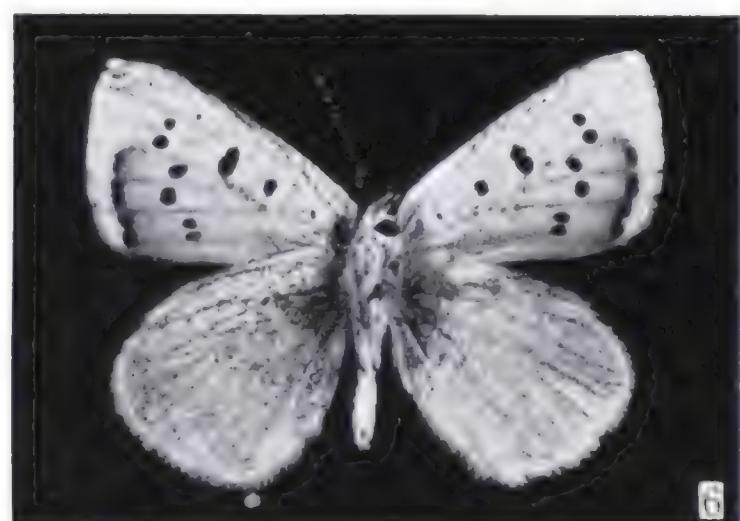
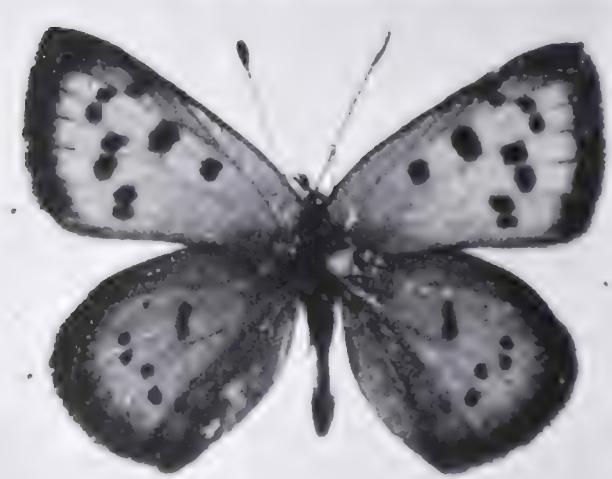
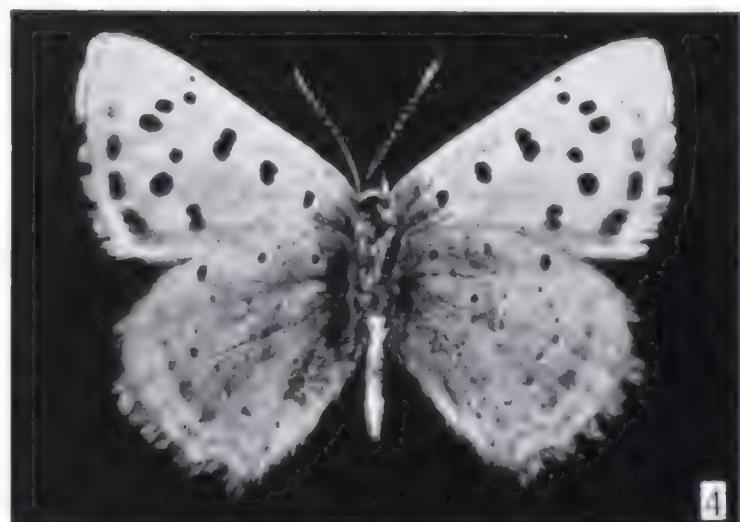
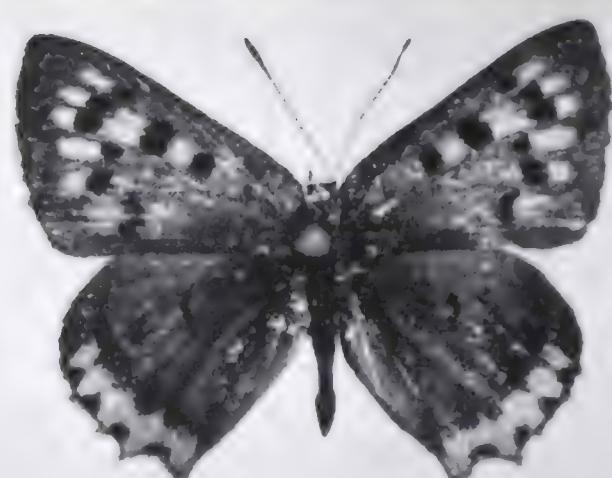
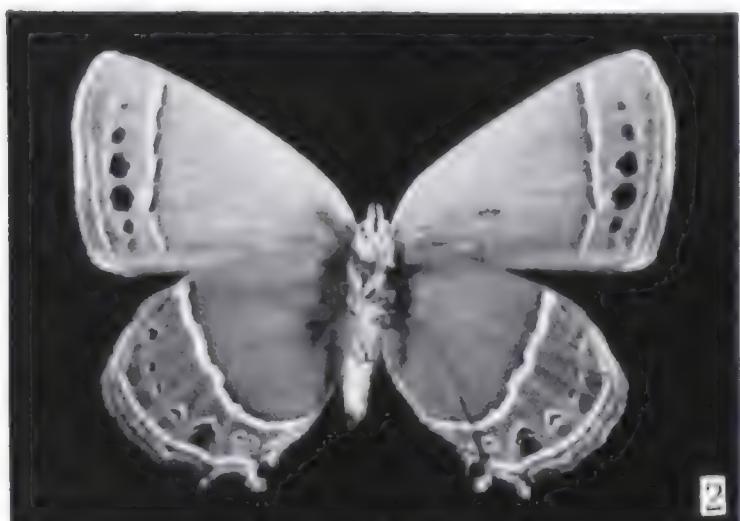


**PLATE IV**

*Strymonidia sassanides* (KOLLAR, 1850), 1 & 2, ♀

*Lycaena phlaeas stygiana* (BUTLER, 1880), 3 & 4, ♂

*Lycaena kasyapa* (MOORE, 1888), 5 & 6, ♂; 7 & 8, ♀



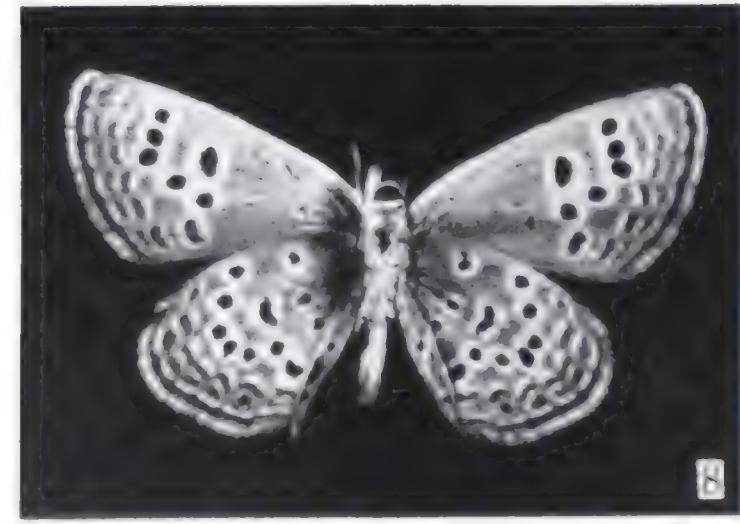
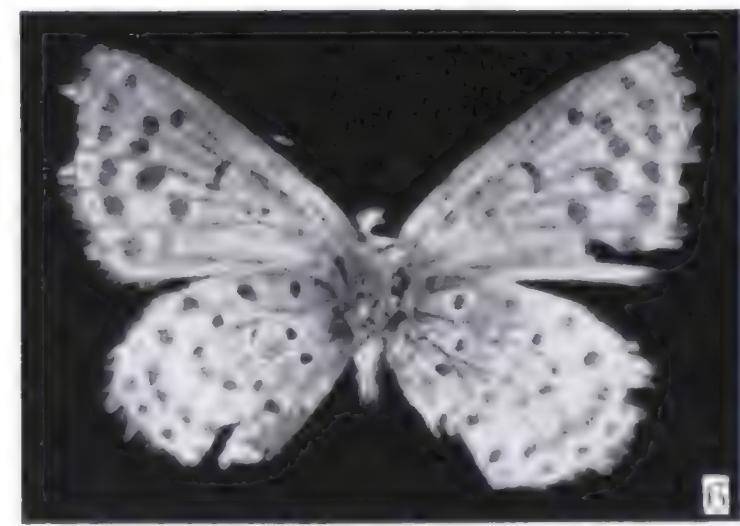
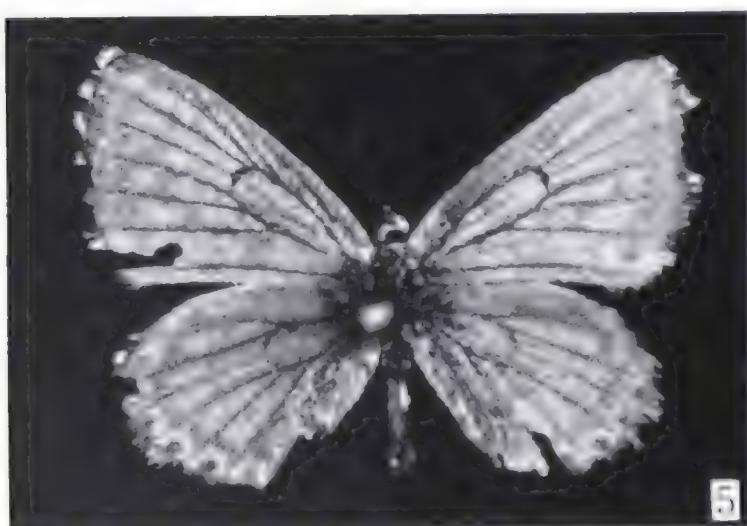
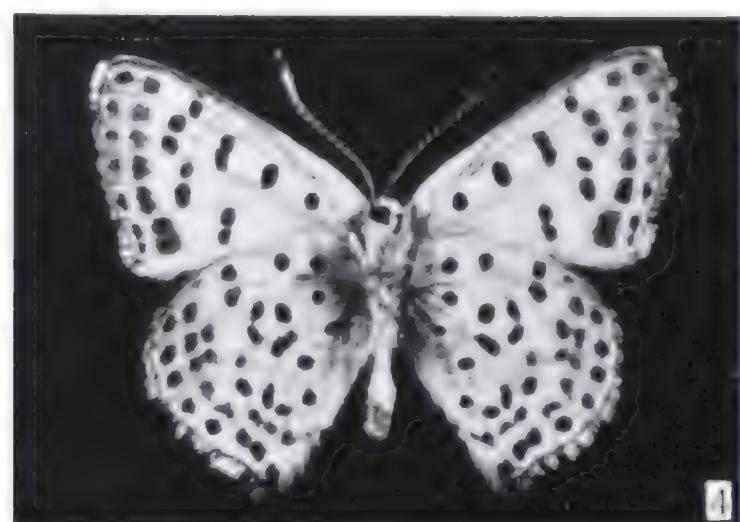
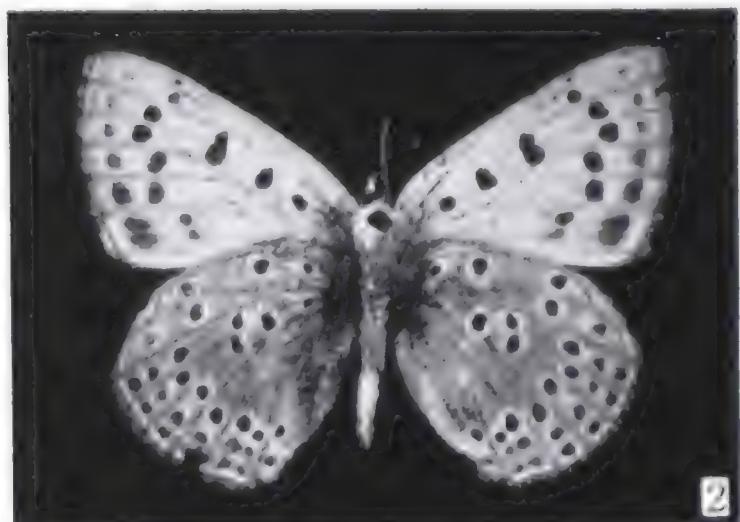
## **PLATE V**

*Lycaena alciphron gordius* (SCHULZENS, 1776), 1 & 2, ♂

*Lycaena dorilis dorilis* (HUFNAGEL, 1767), 3 & 4, ♂

*Scolitantides vicrama cashmirensis* MOORE, 1874, 5 & 6, ♂

*Vaccinina iris ashretha* (EVANS, 1926), 7 & 8, ♂

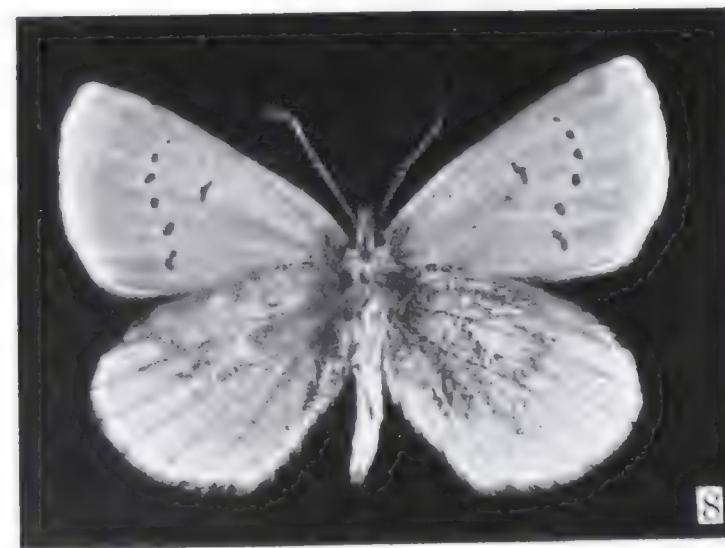
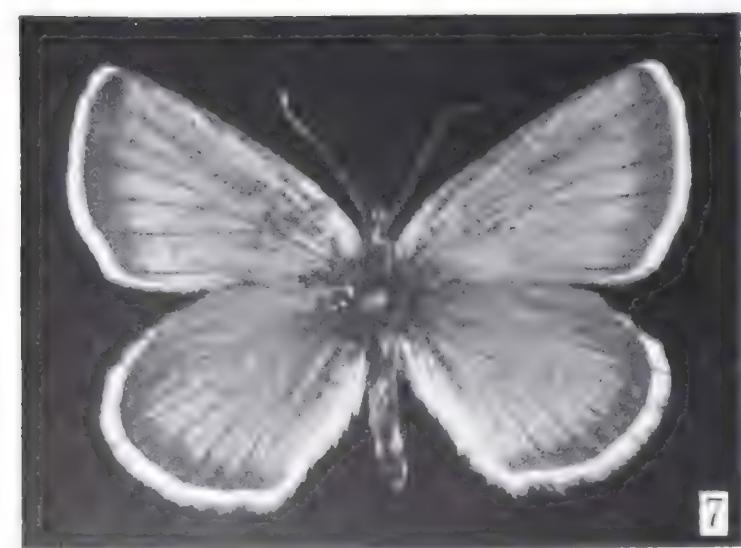
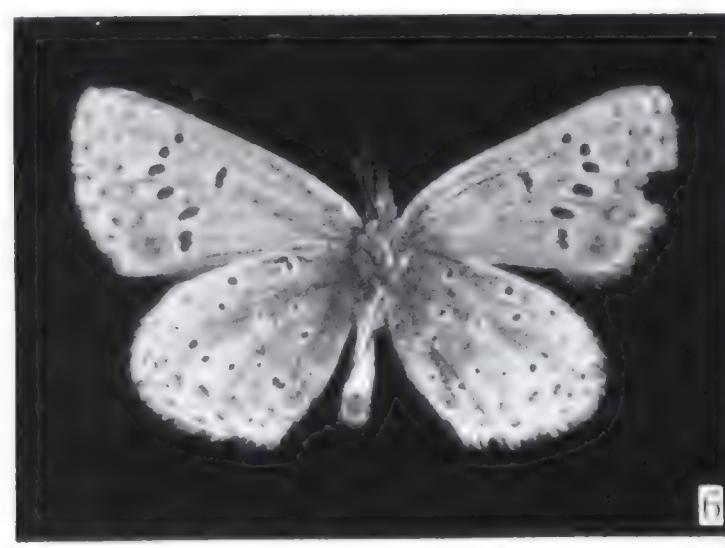
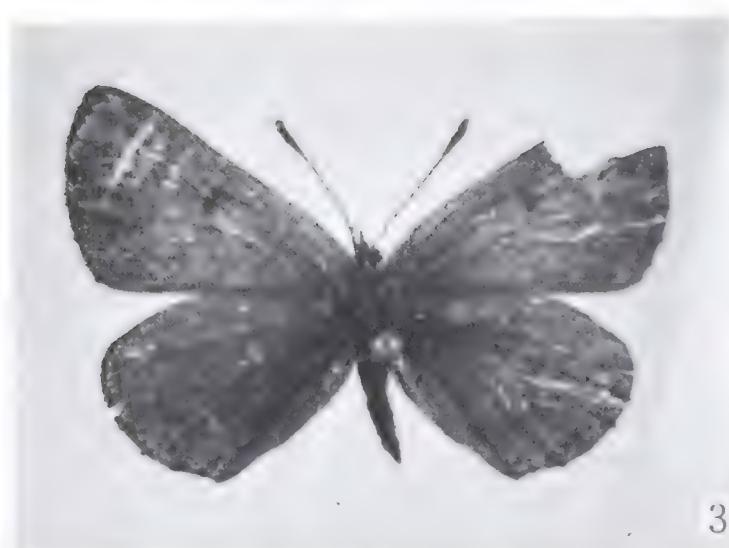


## **PLATE VI**

*Eumedonia eumedon jermyni* (SWINHOE, 1910), 1 & 2, ♂ ; 3 & 4, ♀

*Aricia agestis* (DENIS & SCHIFFERMÜLLER, 1775) subspecies, 5 & 6, ♂

*Albulina metallica gilgitica* (TYTLER, 1926), 7 & 8, ♂

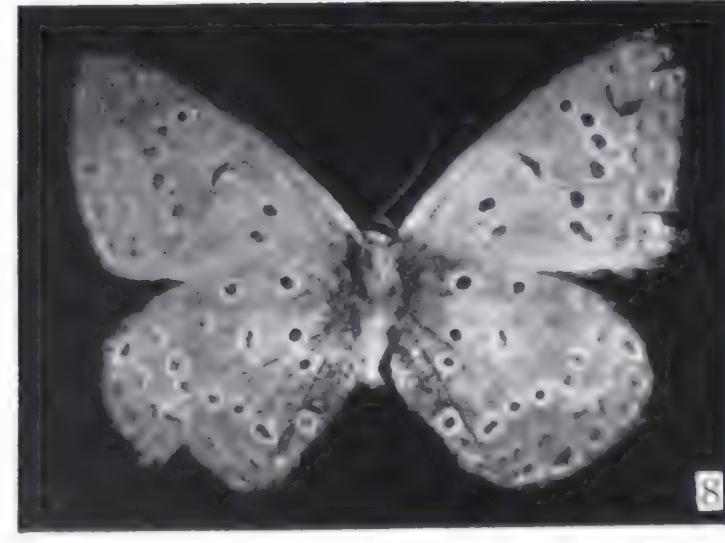
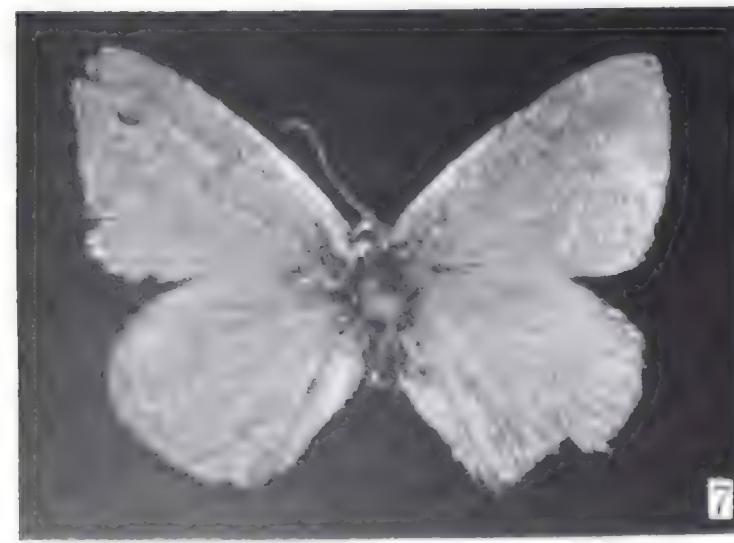
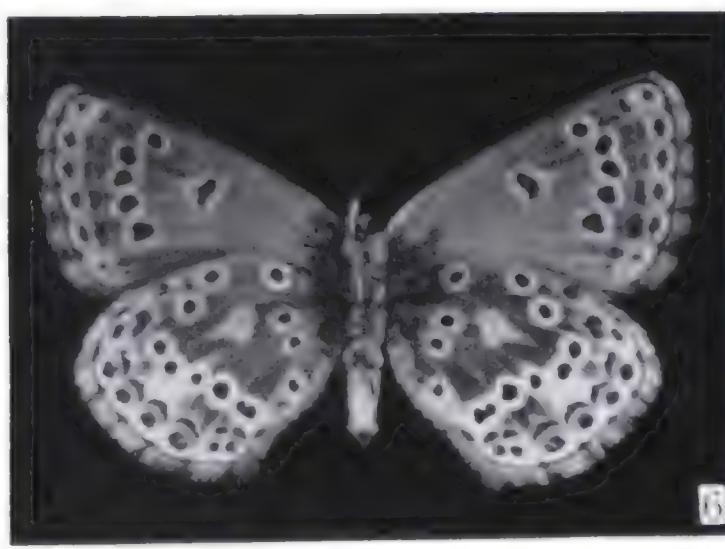
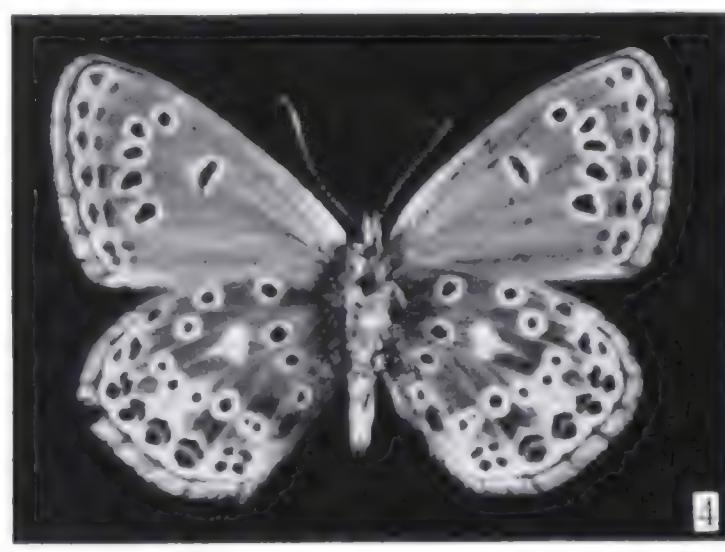
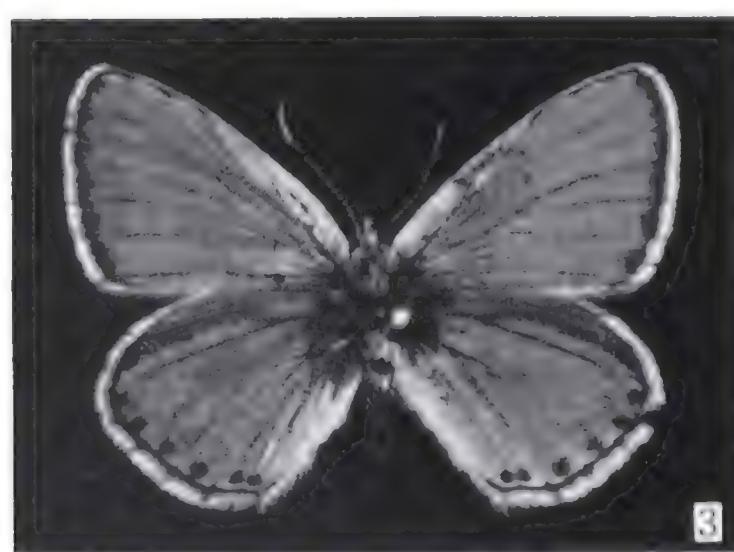
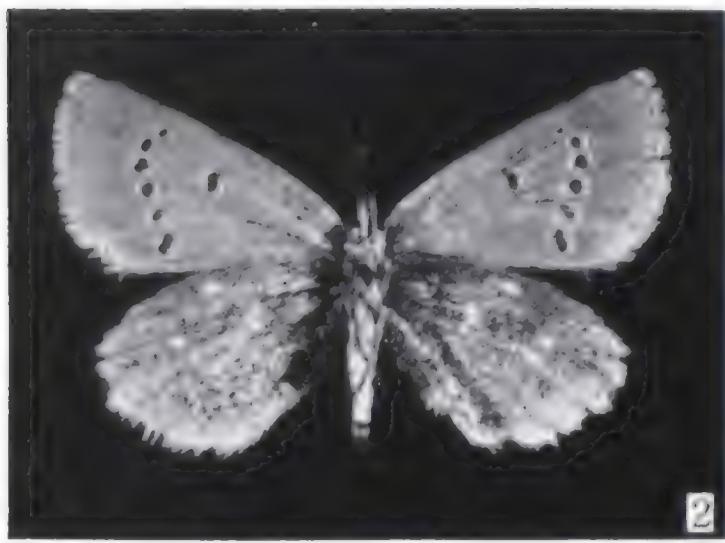


## **PLATE VII**

*Albulina metallica gilgitica* (TYTLER, 1926), 1 & 2, ♀

*Polyommatus sarta sartoides* SVINHOE, 1910, 3 & 4, ♂ ; 5 & 6 ♀

*Polyommotus icarus* (ROTTENBURG, 1775), 7 & 8, ♂ (*persica*)

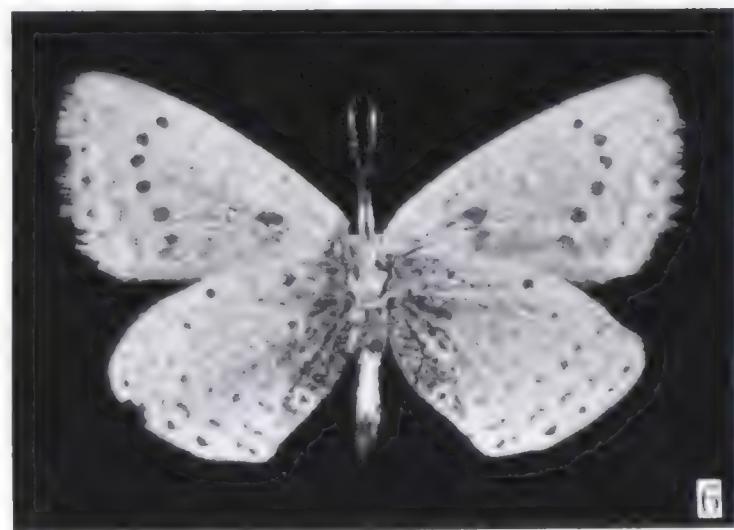
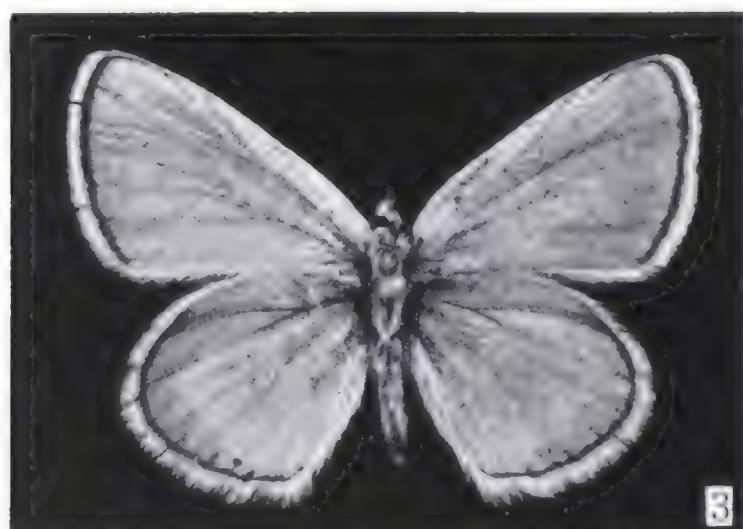
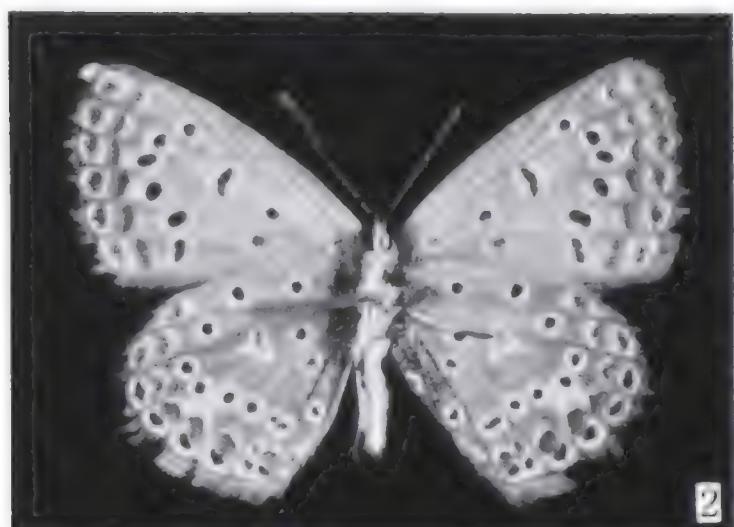


## **PLATE VIII**

*Polyommatus icarus* (ROTTENBURG, 1775)

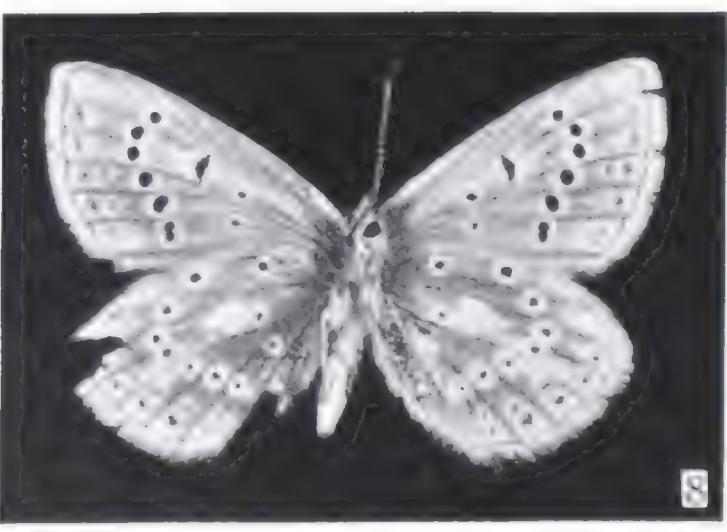
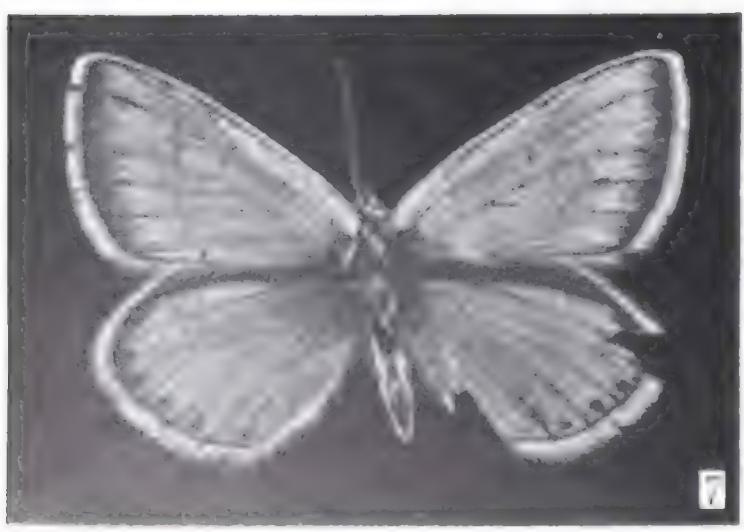
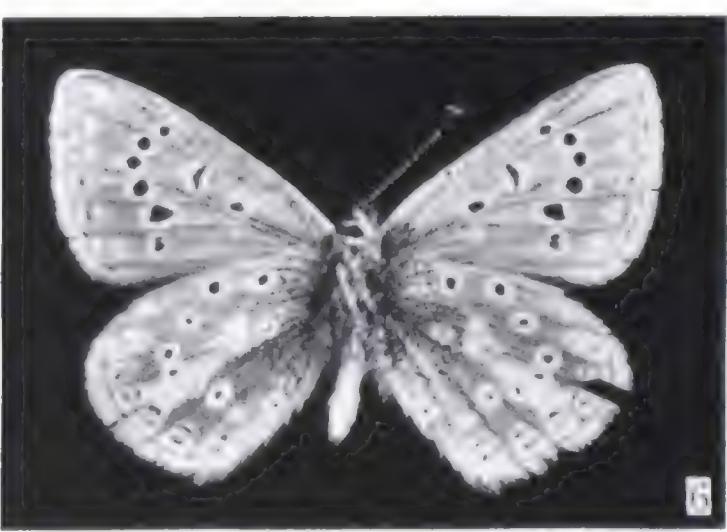
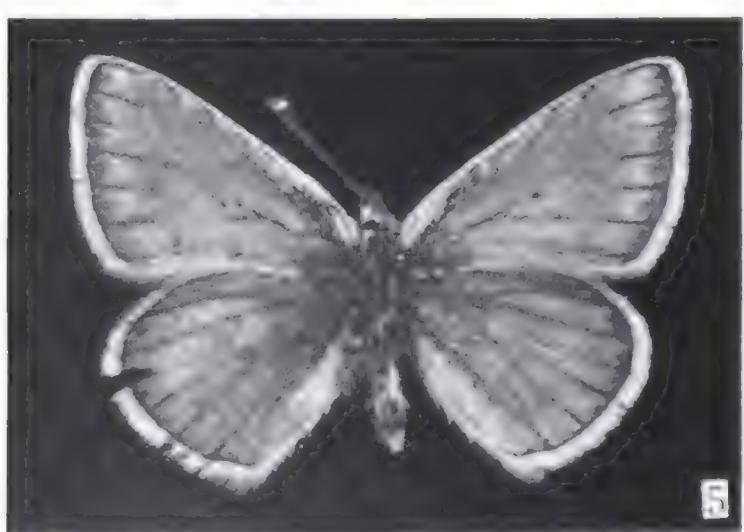
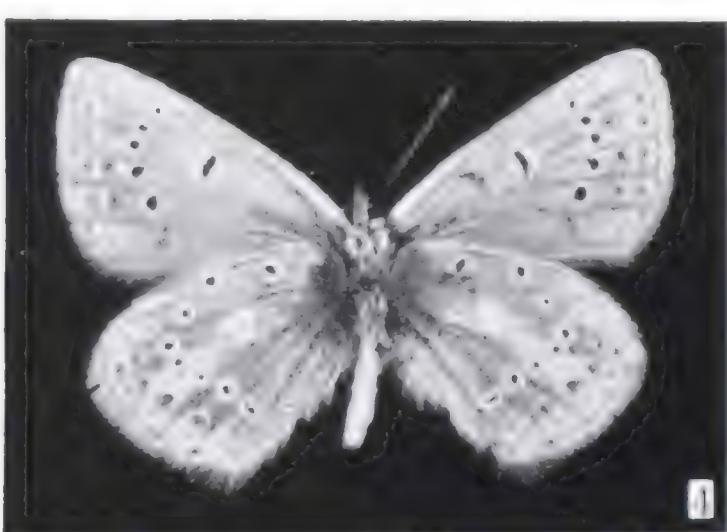
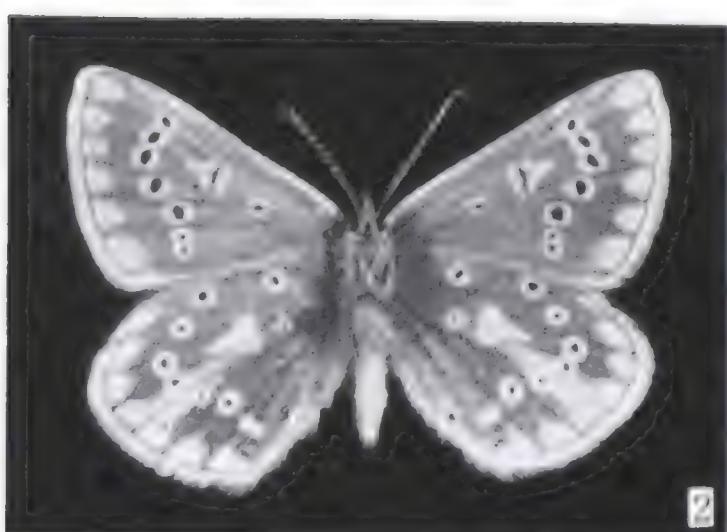
1 & 2, ♀ (*persica*) ; 3 & 4, ♂ ; 5 & 6, ♀ (*fugitiva*) ;

7 & 8, ♀ (*chitralensis*)



## **PLATE IX**

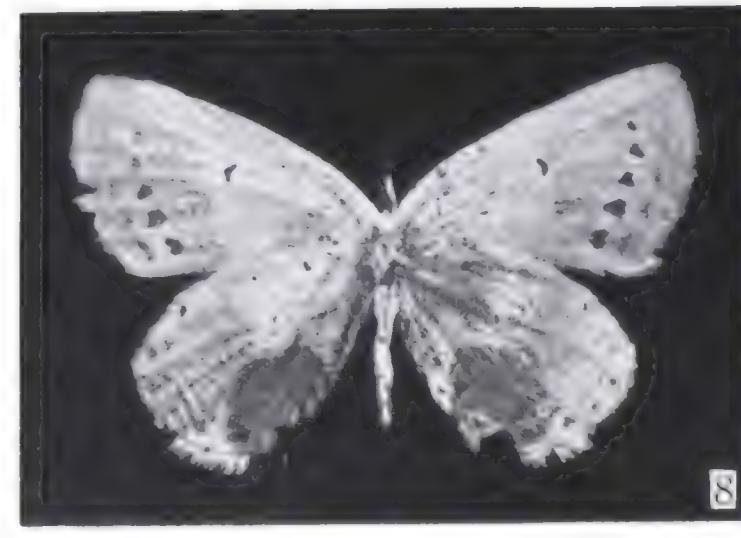
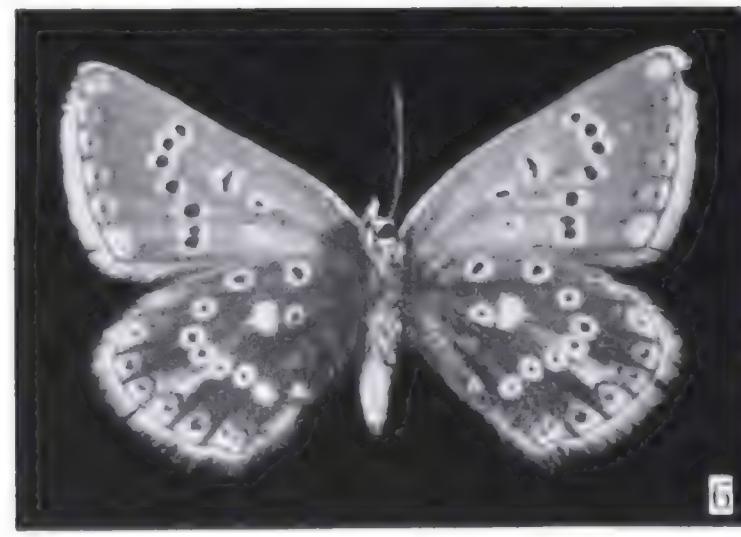
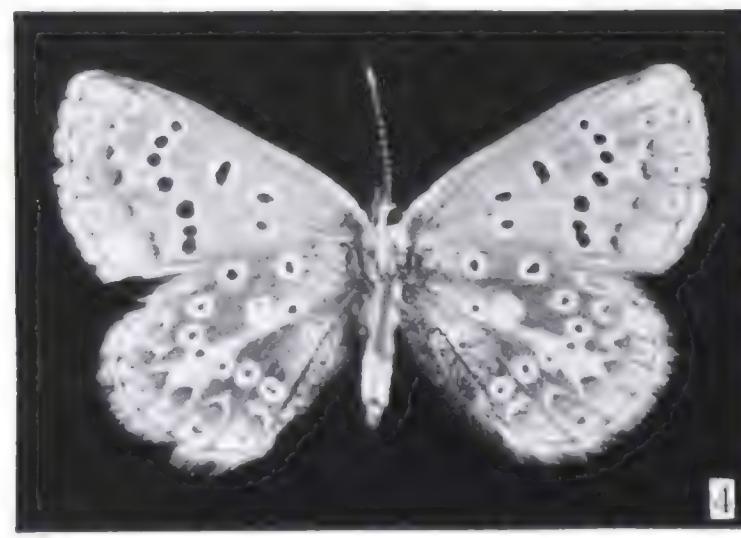
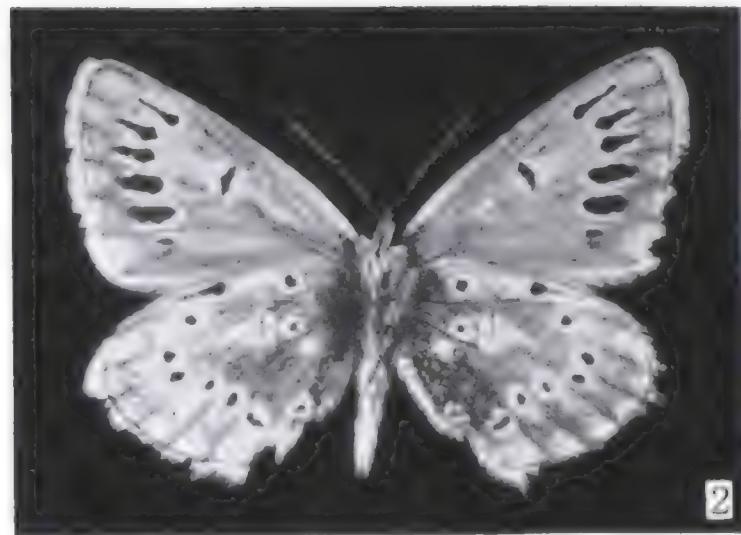
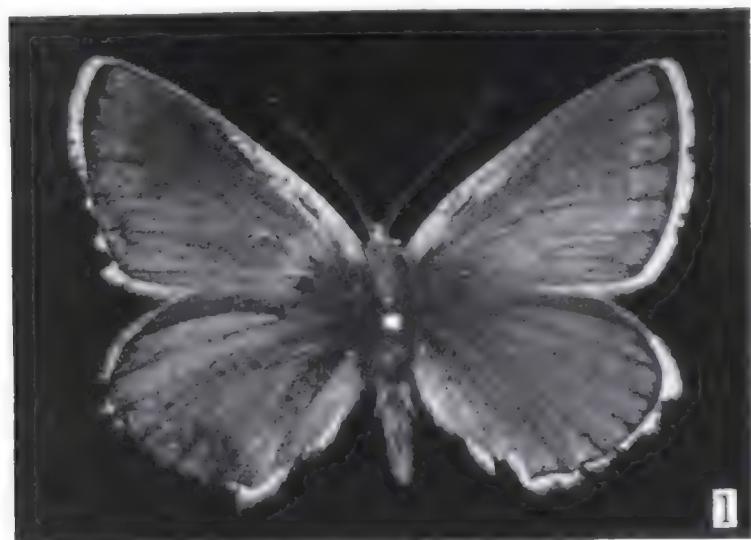
*Polyommatus eros* (OCHSENHEIMER, 1808) subspecies, 1-8, ♂



## **PLATE X**

*Polyommatus eros* (OCHSENHEIMER, 1808) subspecies, 1 & 2, ♂ ; 3-6, ♀

*Lycaeides christophi samudra* (MOORE, 1874), 7 & 8, ♀

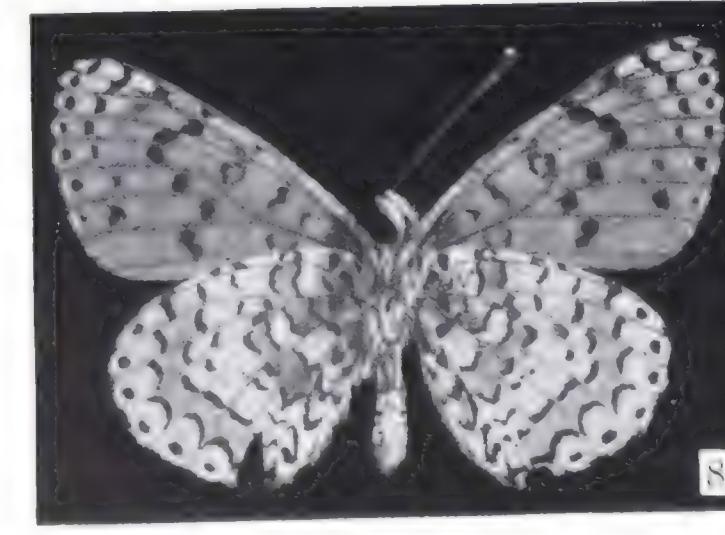
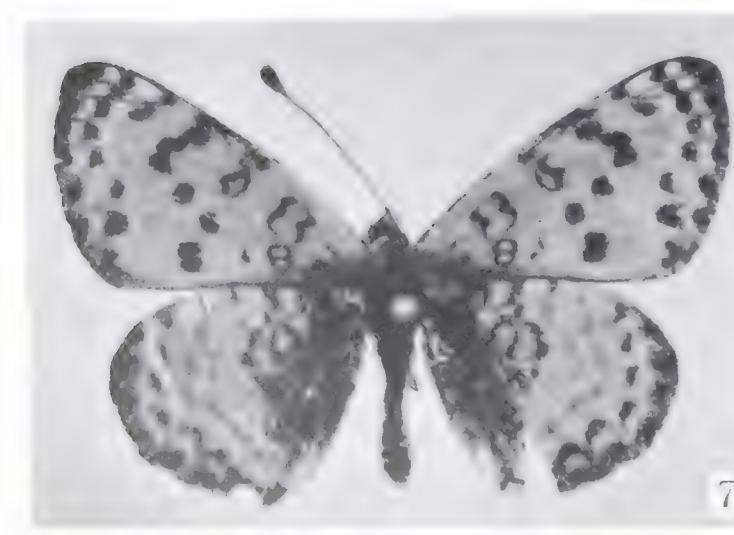
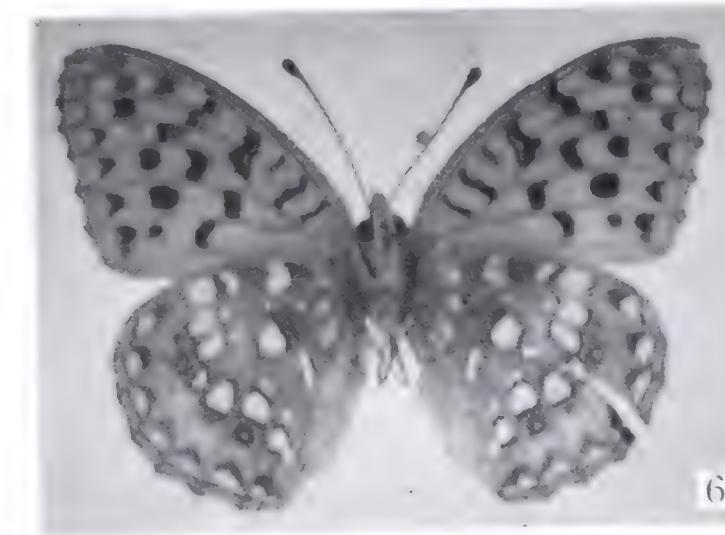
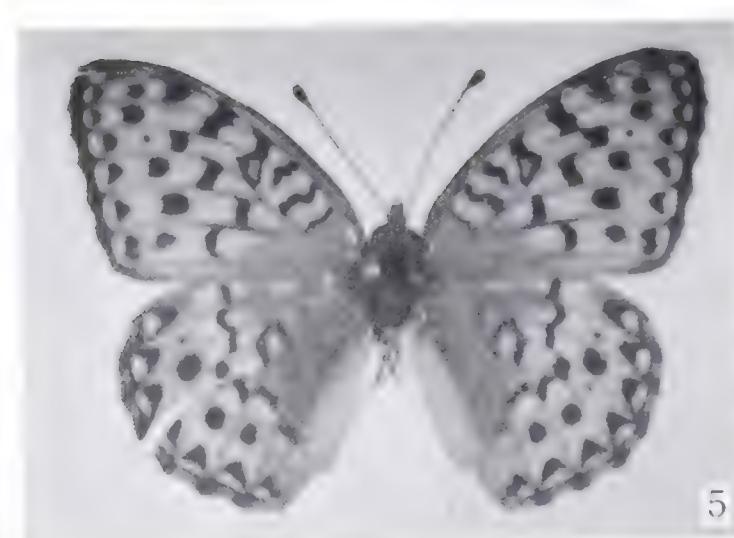


## **PLATE XI**

*Clossiana jerdoni chitralensis* (MOORE, 1900), 1 & 2; ♂, 3 & 4, ♀

*Fabribiana niobe jainadeva* (MOORE, 1864), 5 & 6, ♂

*Melitaea didyma mixta* EVANS, 1912, 7 & 8, ♂



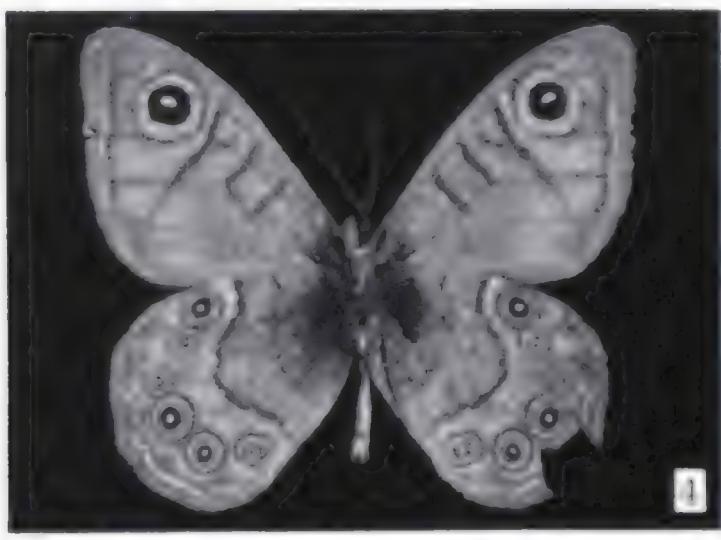
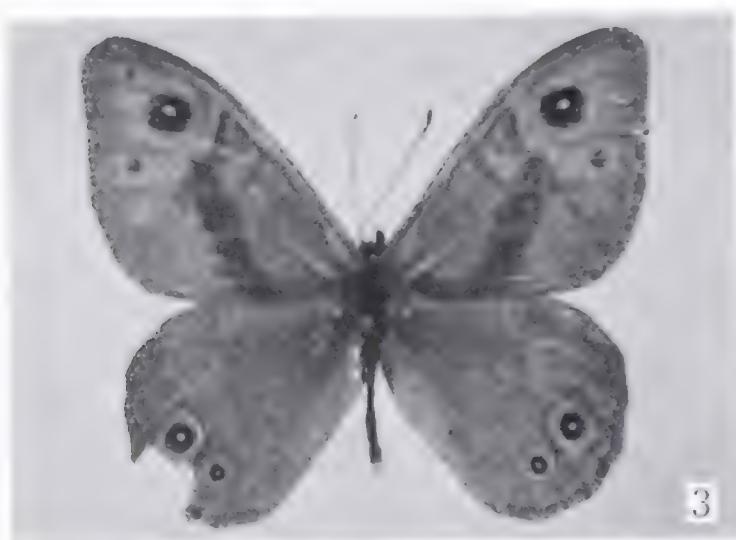
## PLATE XII

*Kirinia climene alticola* (LE CERF, 1913), 1 & 2, ♀

*Lasiommata menava menava* MOORE, 1865, 3 & 4, ♂

*Aulocera padma padma* (KOLLAR, 1844), 5 & 6, ♂

*Aulocera swaha swaha* (KOLLAR, 1844), 7 & 8, ♂

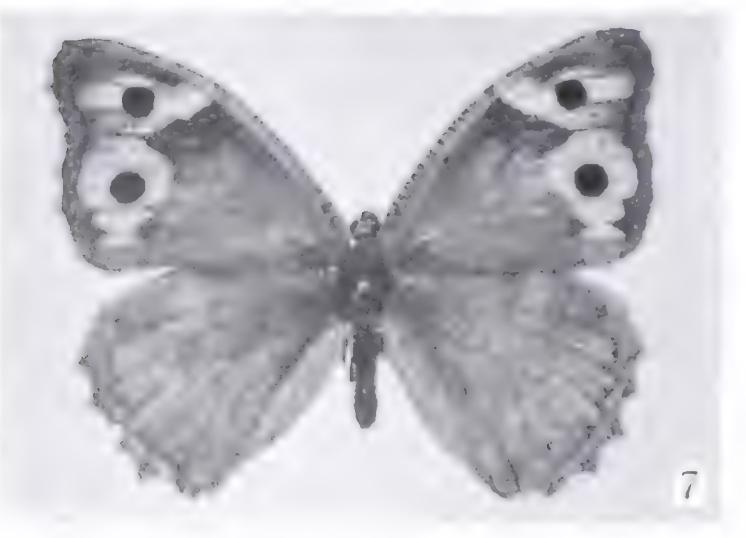
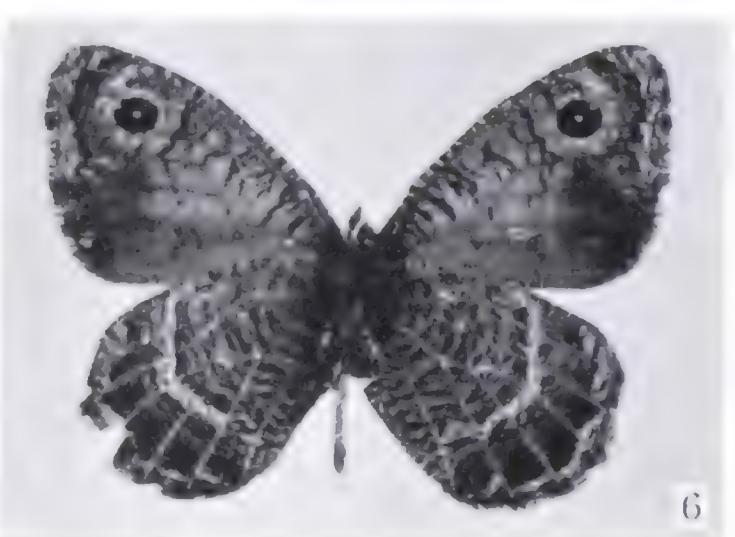
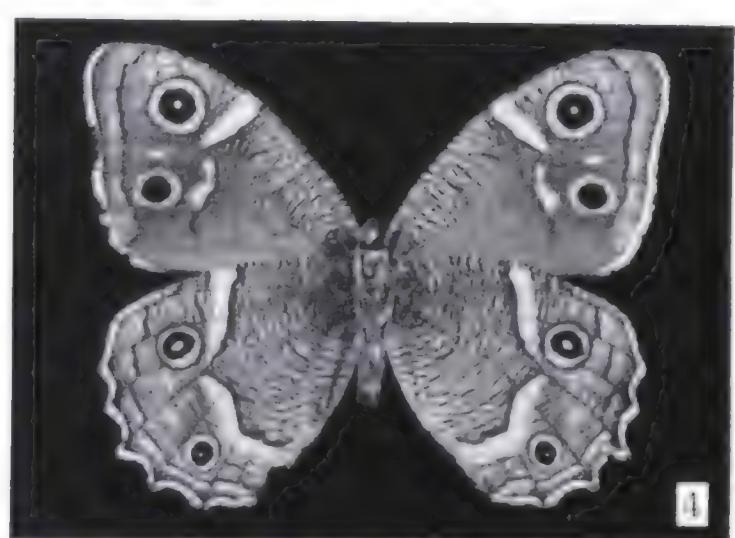
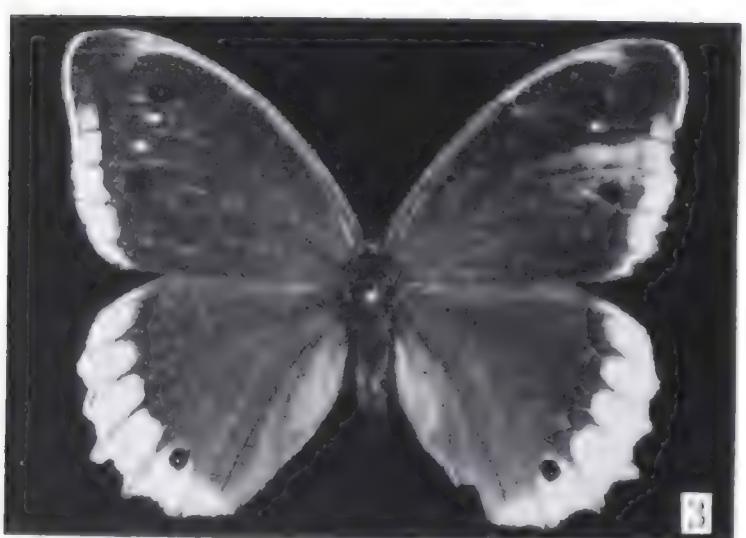
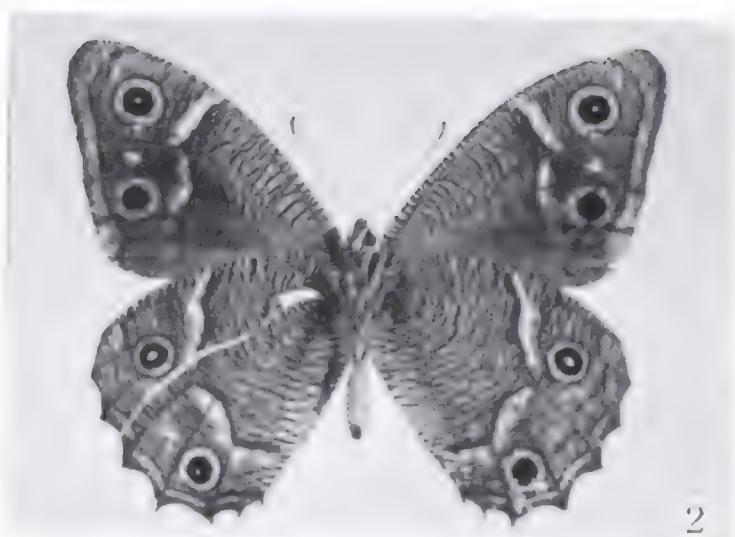


## **PLATE XIII**

*Hipparchia (Neohipparchia) parisatis parsis* (LE CERF, 1913), 1 & 2, ♂ ; 3 & 4, ♀

*Satyrus actaea parthica* LEDERER, 1869, 5 & 6, ♂

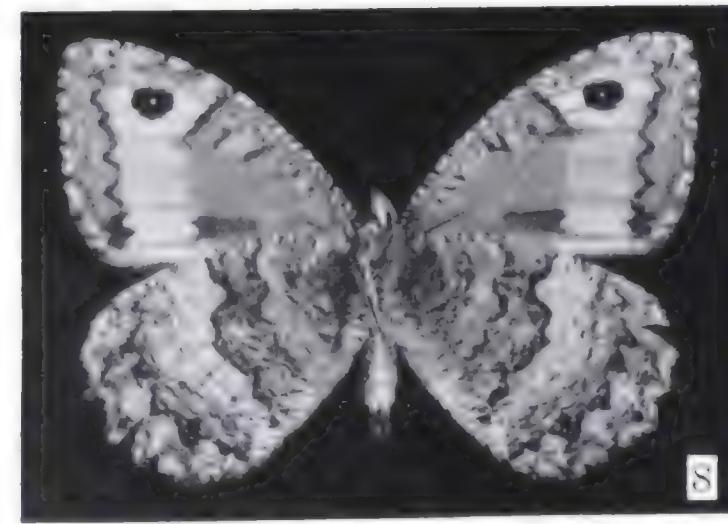
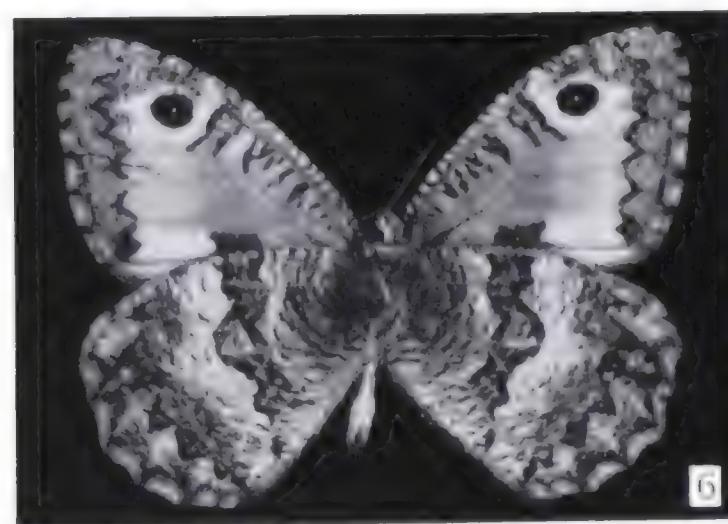
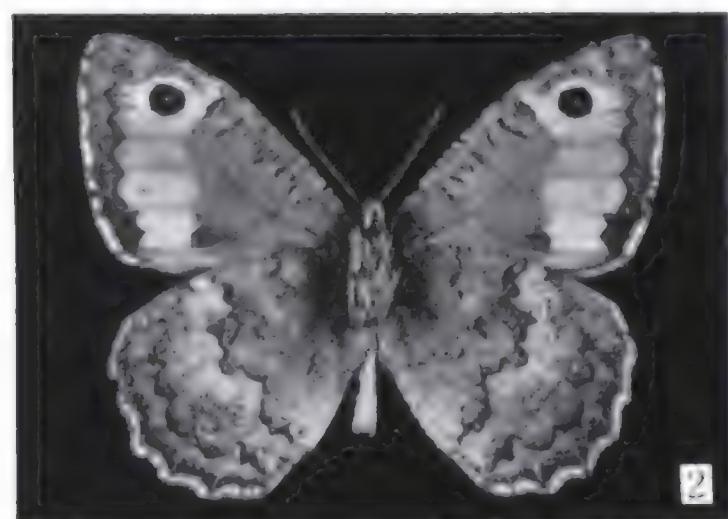
*Pseudochazara thelephassa* (HÜBNER, 1819-27), 7 & 8 ♀



**PLATE XIV**

*Pseudochazara mniszechii droshica* (TYTLER, 1926), 1 & 2, ♂ ; 3 & 4, ♀

*Kanetisa (Kanetisa) digna digna* (MARSHALL, 1882), 5 & 6, ♂ ; 7 & 8,



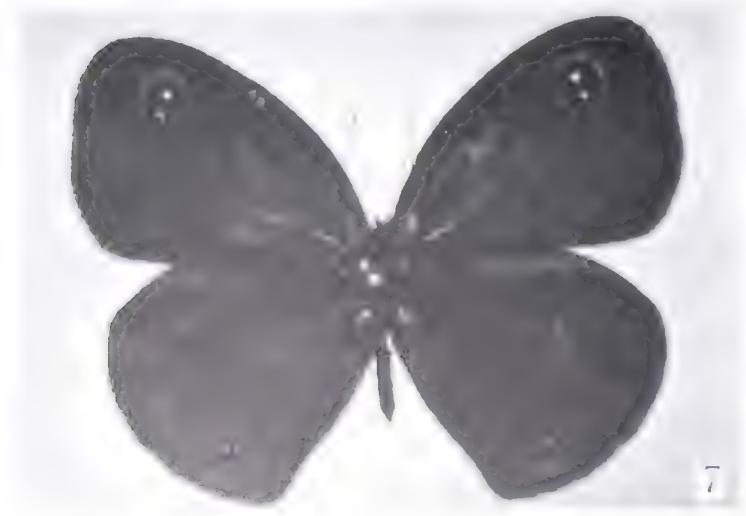
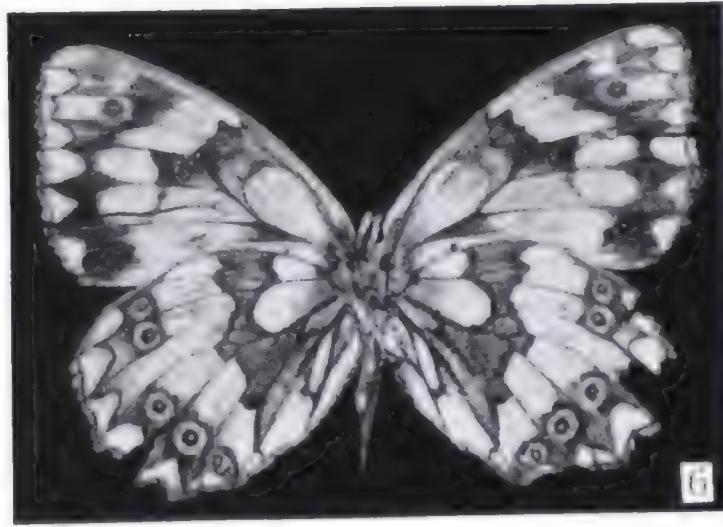
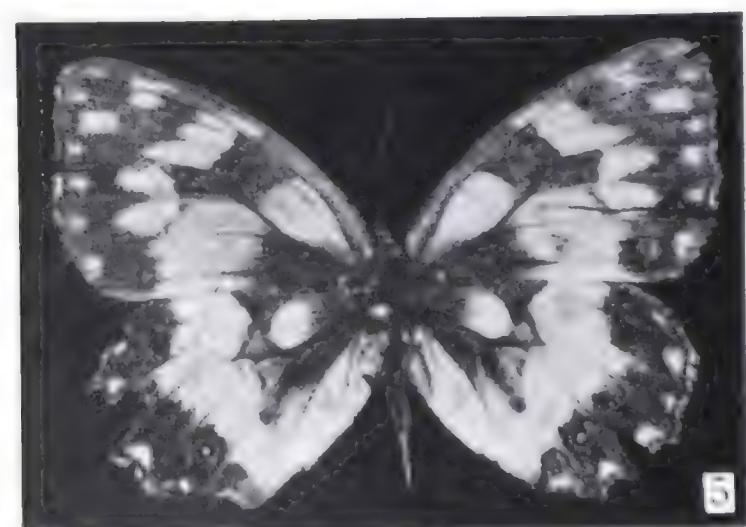
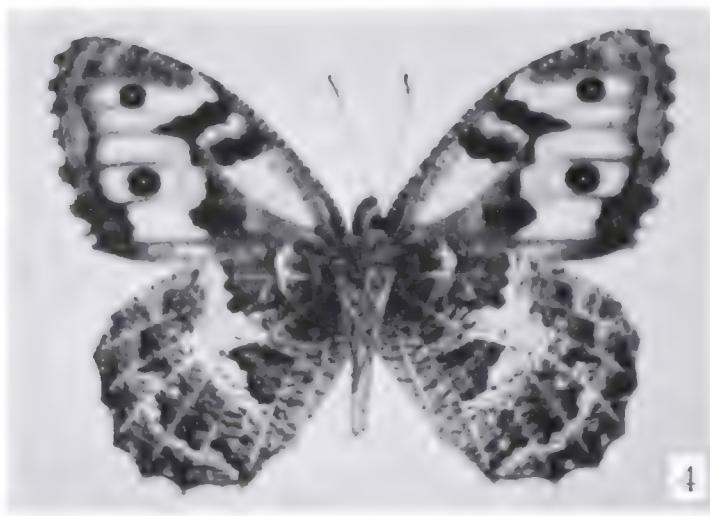
**PLATE XV**

*Chazara briseis hyrcana* (STAUDINGER, 1886), 1 & 2, ♂

*Chazara heydenreichi shandura* (MARSHALL, 1882), 3 & 4, ♂

*Melanargia galathea* (LINNÉ, 1758) subspecies, 5 & 6, ♀

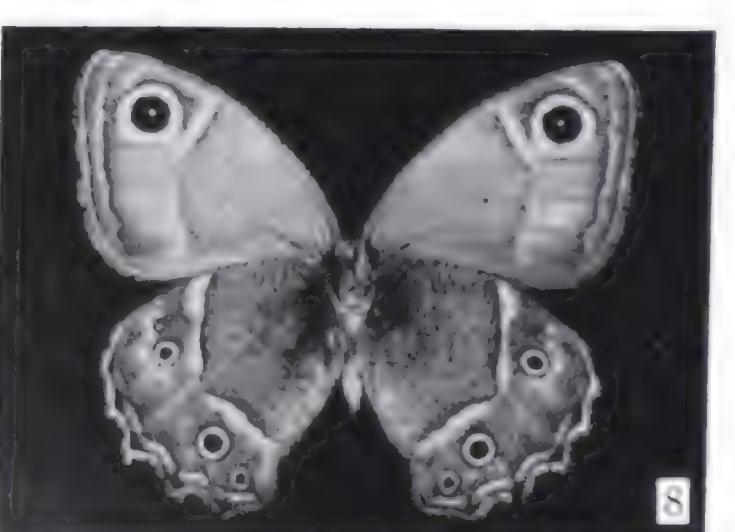
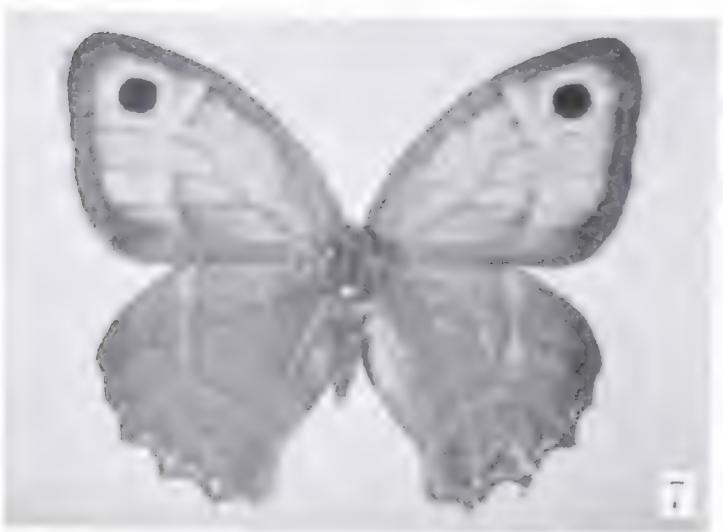
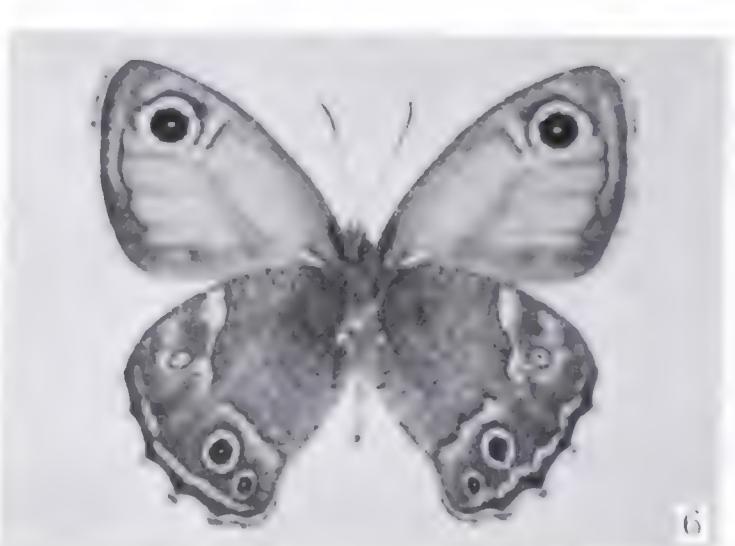
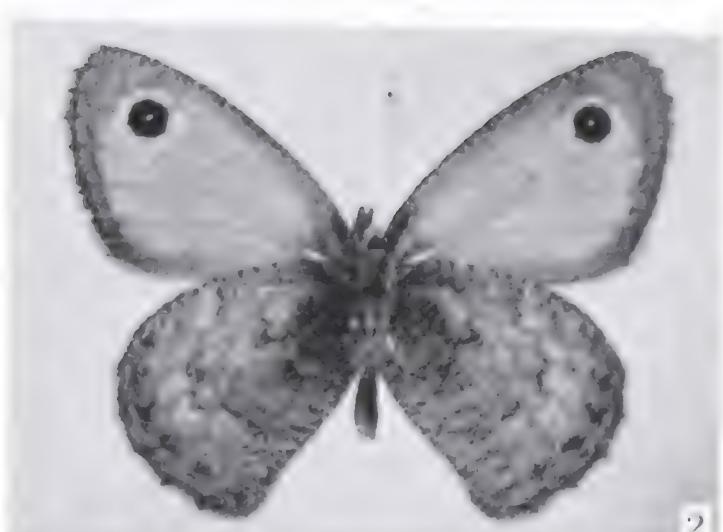
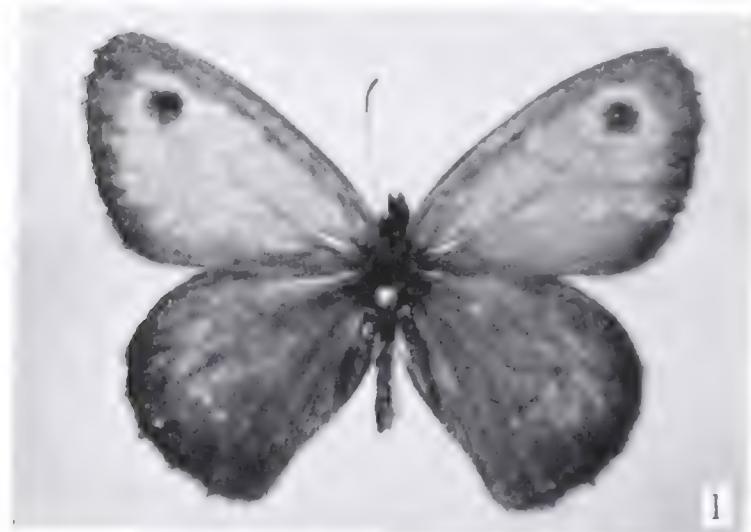
*Callerebia nirmala materta* FRUHSTORFER, 1916, 7 & 8, ♂



**PLATE XVI**

*Hyponephele pulchra* (C. & R. FELDER, 1867) subspecies, 1 & 2, ♂ ; 3 & 4, ♀

*Hyponephele davendra* (MOORE 1865) subspecies, 5 & 6, ♂ ; 7 & 8, ♀



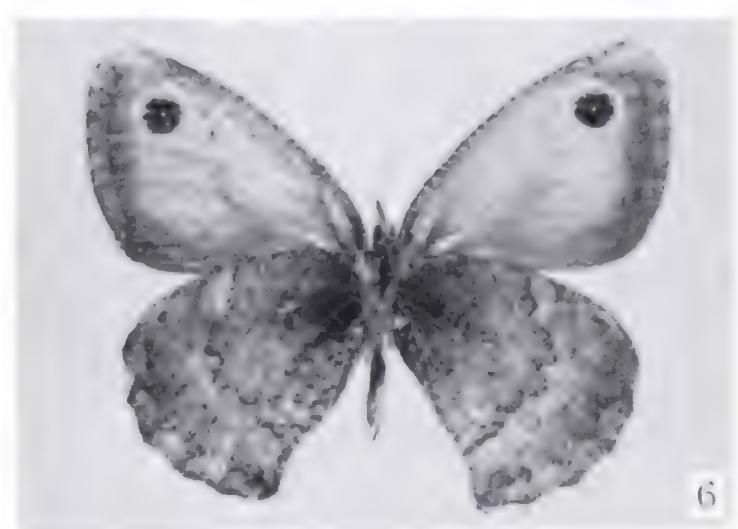
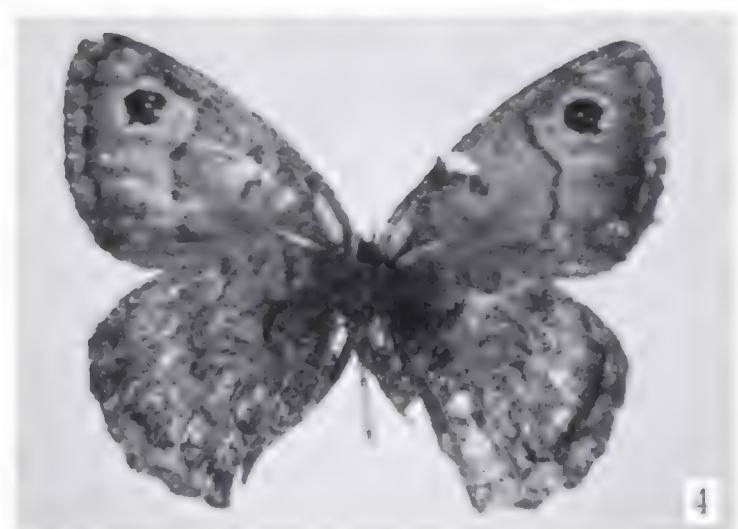
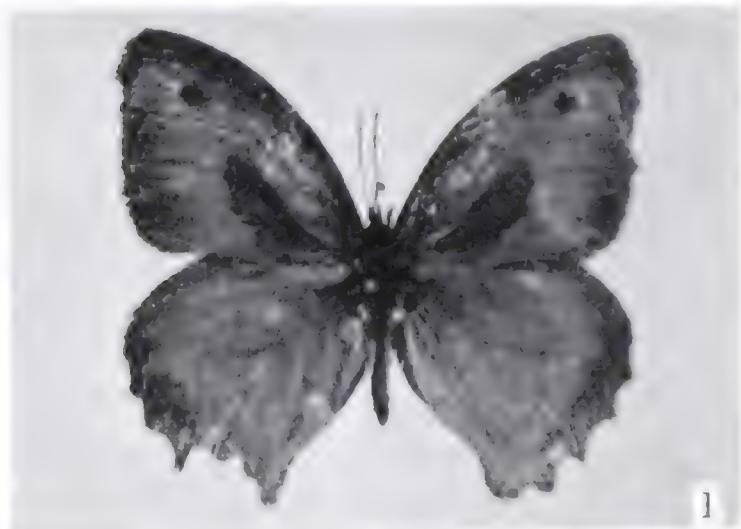
**PLATE XVII**

*Hyponephele lupinus centralis* (RILEY, 1921), 1 & 2, ♂

*Hyponephele amardaea amardaea* (LEDERER, 1869), 3 & 4, ♂

*Hyponephele cadusia cadusia* (LEDERER, 1869), 5 & 6, ♂

*Hyponephele lycaon collina* (ROBER, 1897), 7 & 8, ♂





ARTICLE VII

ARTICLE VIII

MORIMOTO: COLEOPTERA

KIMOTO: COLEOPTERA



VII.

Coleoptera : Curculionidae<sup>1)</sup>

(1 text-figure)

Katsura MORIMOTO\*

1. *Scepticus rotundicollis* MORIMOTO, sp. nov.

♀. Head transverse, slightly widened posteriorly, weakly depressed on each side above the posterior margin of eyes, rugose; eyes small, weakly convex, dorsal and anterior margin of eyes shallowly depressed; rostrum as long as wide, gently narrowed from eyes to the basal one-third, thence slightly widened towards the apex, dorsal surface flat, with a median sulcus between the antennal insertion and the base of rostrum, antennal scrobes deep, rapidly curved downwards behind and narrowly separated from eyes at the extremity; antennae inserted a little behind the apex of rostrum, scape clavate on the distal half, reaching the middle of eye, funi-

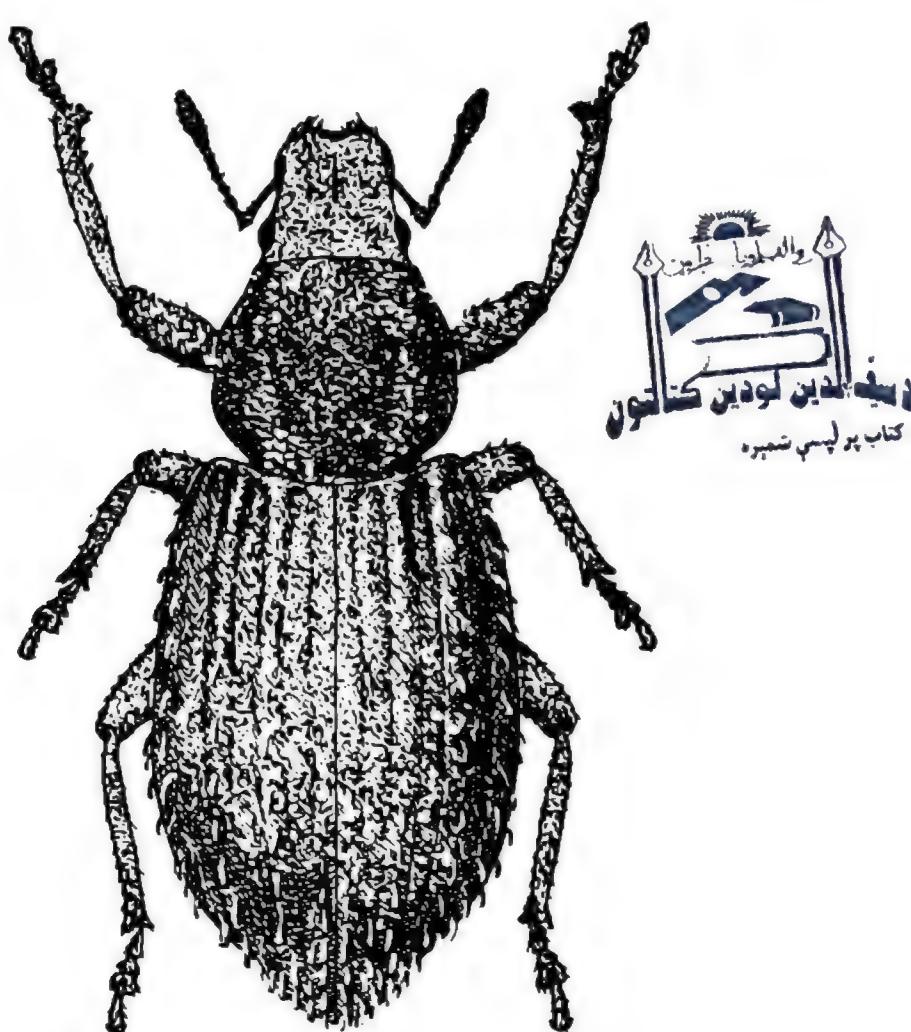


Fig. 1. *Scepticus rotundicollis* n. sp.

1) Contribution Ser. 2, No. 94, Entomological Laboratory of Kyushu University.

\* Forestry Experiment Station, Meguro-ku, Tokyo.

cle 7-segmented, 7th segment annexed to club, 1st segment robust, 1.5 times as long as wide, 2nd segment the narrowest, a little shorter than the 1st, 3rd segment as long as wide and half the length of the 2nd, the remaining segments transverse, club twice as long as wide.

Pronotum a little broader than long (5:4), the sides strongly rounded, broadest a little behind the middle, anterior margin scarcely broader than the posterior one, disc sparsely punctured, interspace of the punctures rugose, median sulcus absent.

Scutellum minute, triangular.

Elytra much longer than wide (11:7.5), 5/2 times as long as pronotum, the sides subparallel between the middle and the basal 1/3, thence slightly rounded to the shoulders and gently rounded and narrowed behind; punctured striae weak; intervals broad and flat, 3rd and 5th intervals costate on the basal 1/4, 2nd-5th intervals with the same width to each other and a little broader than the 1st.

Femora clavate, unarmed. Front tibiae slightly curved inwards, armed with four bristles on the inner margin; median and hind tibiae straight, hind tibiae with corbels narrowly enclosed. Tarsi with 4th segment the longest, a little shorter than the remaining segments taken together, 2nd segment conical, transverse, 3rd segment bilobed, a little broader than the 2nd; claws free, simple.

Mesosternal process parallel-sided, weakly convex, truncate at tip; metasternum much shorter than the 1st segment of abdomen. Abdomen with the process truncate and as broad as metacoxa, 1st segment behind coxa slightly narrower than the 2nd, posterior margin of the 1st segment weakly bisinuate, 2nd segment as broad as the 3rd and 4th taken together at the lateral margin, slightly arched posteriorly, 1st and 2nd segments flat at the median part, 5th segment weakly convex.

General coloration black, underside, antennae and tarsi reddish brown to dark reddish brown. Derm covered closely with brownish grey to greyish small scales, greyish scales are a little closer on rostrum and head; pronotum with a pair of vague longitudinal greyish stripes; each interval of elytra with a row of setae, these on 3rd, 5th and 7th intervals and the apical part of elytra are whitish and longer than the other brownish ones, which are seen on head and the basal 2/3 of the 2nd, 4th and 6th intervals of elytra.

Length: 4.9 mm (including rostrum).

Holotype ♀: a meadow near Darkot, Punjab-Hindukush, 10. X. 1956, captured under a stone. The type is preserved in the collection of the Entomological Laboratory of Kyushu University in Fukuoka.

This new species may be separable from *S. callosus* HUSTACHE (1928), by the absence of callus on frons; from *S. kashimirensis* MARSHALL (1916), by the absence of the transverse depression before eye; from *S. griseus* ROELOFS (1873), *S. hachijoensis* KÔNO (1930), *S. insularis* ROELOFS (1873), *S. minowai* KÔNO (1930), *S. tigrinus* ROELOFS (1873), and *S. uniformis* KÔNO (1930), by the absence of the

median depression or median longitudinal sulcus on pronotum; and from *S. caesinus* MARSHALL (1916), *S. griseolus* VOSS (1959), and *S. tristis* VOSS (1943), by the costate elytra on the basal part of the 3rd and 5th intervals. The shape of pronotum of this new species is very characteristic.

2. *Tylacites noxius* FAUST, 1886.

2 ex., a meadow near Darkot, Punjab-Hindukush, 10. X. 1956, captured under a stone.

2 ex., Baj Gaz Ann, Iran (4200 m), 12. IX. 1956, K. YOSHIBA leg.

3. *Ammocleonus* sp.

1♀, Najin, 12. VII. 1956, S. AZUMA leg. (Almost all the clothings of derm were lost).



## VIII.

### Coleoptera : Chrysomelidae<sup>1)</sup>

(1 text-figure)

Shinsaku KIMOTO\*

#### I. India (Punjab to Hindukush)

##### 1. *Chrysomela populi* LINNÉ (Chrysomelinae)

Syst. Nat, ed. 10, 1758, p. 370.—Maulik, Fauna Brit. Ind., Col., Chrysomelidae (Chrysomelinae), 1926, p. 68.

Distribution: Europe, N. Africa, North and West Asia, China, Japan and India (Himalayas, Assam).

Specimen examined: 1 ex., Baj Gaz Ann, 12. Sept. 1956, K. YOSHIBA leg.

##### 2. *Theone octocostata* (WEISE) (Glerucinae)

Arch. f. Naturg., 1921, LXXVIII, A 2, p. 92 (*Leptosonyx*).—Maulik, Fauna Brit. Ind., Col. Chrysomelidae (Galerucinae), 1926, p. 75 (*Leptosonyx*).—OGLOBIN, Faune l'URSS, Chrysomelidae (Galerucinae), 1926, XXVI, 1, pp. 58, 61 et 382, f. 25.

Distribution: Ferghana, Pamir, Iran, Beludshistan, India (Kashmir).

Specimens examined: 4 exs., Magahe, Iran, 8. Oct. 1956, S. AZUMA leg.; 2 exs., Tschalus, 19. Sept. 1956, S. AZUMA leg.

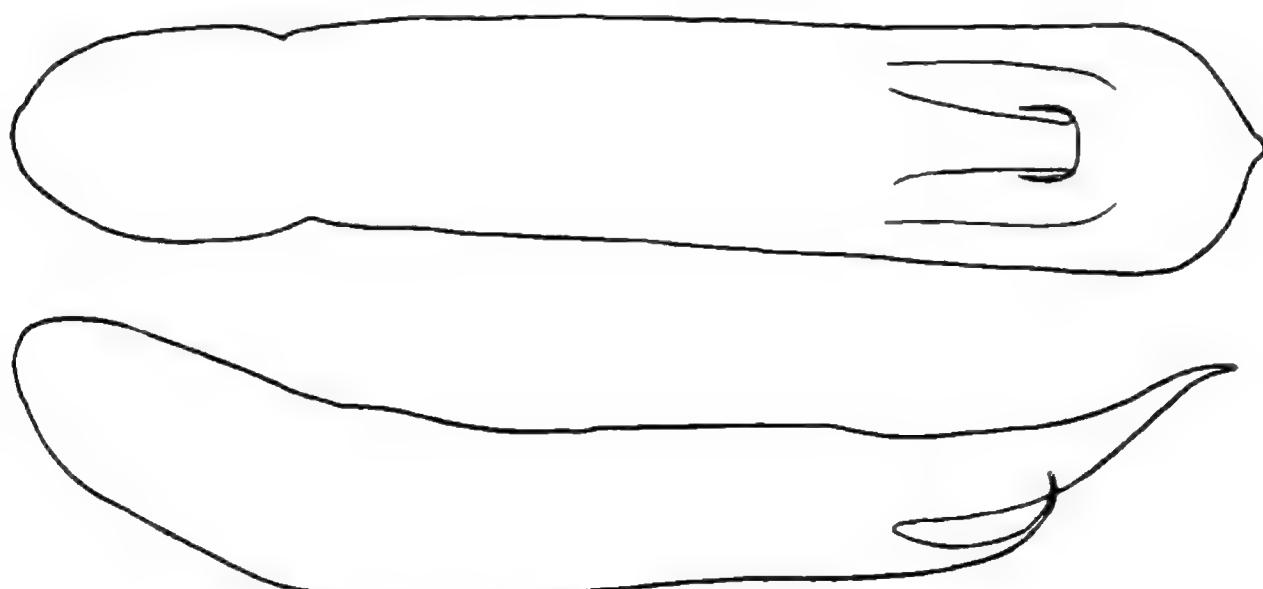


Fig. 1. Male genitalia of *Crepidodera ferruginea*.

1) Entomological Laboratory, Faculty of Agriculture, Kyushu University.

\* Contribution Ser. 2, no. 110, Entomological Laboratory, Kyushu University.

## II. Iran

3. *Altica* sp. (Alticinae)

Specimens examined: 3 exs., Passargadae, 27. Aug. 1956, TAKAYA leg.

4. *Crepidodera ferruginea* (SCOPOLI) (Alticinae) (Fig. 1)

Ent. Carn., 1763, p. 70 (*Chrysomela*). — HEIKERTINGER, Kol. Rundschau, 1948, XXXI (1/3), p. 57; 1950, XXXI (4/6), p. 129.

Distribution: Europe, Caucasus, Iran, Siberia. Specimen examined: 1 ex., Magahe, 9. Oct. 1956, S. AZUMA leg.

ARTICLE IX | ISHIKAWA : HYMENOPTERA  
ARTICLE X | SASAKAWA : DIPTERA



## IX.

# Hymenoptera Aculeata of Hindukush, Afganistan and Iran<sup>1)</sup>

Ryōsuke ISHIKAWA\*

## VESPIDAE

### 1. *Vespa orientalis* LINNÉ, 1771

Punjab-Hindukush : 1♀, Nomal, 6 IX, 1956 (YOSHIBA).

Afganistan : 6♀♀, Chaman, 2-4 VI, 1955 ; 1♀, Kabul, 2 VII, 1955 (UMESAO).  
Iran ; 1♀, Shruh, 8 VIII, 1956 (S. AZUMA) ; 1♀, Koshan, 10 VIII, 1956 ; 1♀,  
Naīn, viii-12, 1956 (S. AZUMA) ; 2♀♀, Yezd, 14 VIII, 1956 (K. TAKAYA) ;  
5♀♀, Neiriz, 23 VIII, 1956 (K. TAKAYA).

This species is widely distributed over Southern Europe, Northern Africa,  
Madagascar, Asia Minor, Arabia, Iran, Turkestan and Northwestern India.

### 2. *Vespula germanica* (FABRICIUS, 1793)

Iran : 1♀, Yezd, 15 VIII, 1956 (K. TAKAYA) ; 6♀♀, Neiriz, 24 VIII, 26, 1956  
(S. AZUMA) ; 1♀, Shiraz, 25 VIII, 1956 (S. AZUMA) ; 1♀, Tchalus, 23 IX,  
1956 (S. AZUMA).

This species is widely distributed in the Palaearctic Region including Northern  
Africa.

### 3. *Dolichovespula silvestris* (SCOPOLI, 1763)

Punjab Himal—Hindukush : 1♀, Nomar-Nartal, 6 IX, 1956 (YOSHIBA).

This species is widely distributed in Eurasia except the Oriental Region.

### 4. *Pelistes macaensis* (FABRICIUS, 1793)

*Polistes macaensis*, PERKINS, 1903, Entomol. monthly Mag., 37 : 264.

Afganistan ; 2♀♀, Chaman, 1-4 VI, 1955 ; 1♀, 1♀, Kabul, 2-10 VII, 1955  
(UMESAO) ; 1♀, Kandahar, 5 VI, 1955.

Iran : 4♀♀, Kerman, 16-18 VII, 1956 (K. TAKAYA) ; 1♀, Neiriz, 23 VIII, 1956  
(S. AZUMA).

This species is widely distributed in South Africa, Madagascar, Arabia, and the  
Oriental Region to the islands of the Pacific, as well as the islands of the Indian Ocean.

1) Contribution Ser. 2, No. 125, Entomological Laboratory, Kyushu University.

\* Entomological Laboratory, Kyushu University, Fukuoka.

## MUTILLIDAE

5. *Mutilla* sp.

Iran : 1 ♂, Beshuneh, 21 VIII, 1956 (S. AZUMA).

6. *Mutilla* sp.

Iran : 1 ♂, Kerman, 17 VIII, 1956 (S. AZUMA).

## SPHECIDAE

7. *Ampulex* sp.

Afganistan : 1 ♀, Kabul, 10 VII, 1955.

A female specimen of very poor condition.

8. *Ampulex assimilis* KOHL, 1893

Afganistan : 1 ♀, Kerman, 19 VIII, 1956 (K. TAKAYA).

Originally described from Bagdad and Guinea.

9. *Chlorion (Chlorion) regalis* (SMITH, 1873)

Afganistan : 1 ♀, Chaman, 2 VI, 1955.

This remarkable species is widely distributed over Northeastern Africa, Transcasplia and Afganistan.

10. *Sphex heydeni* (DAHLBOM, 1845)

Iran 1 ♀, Maraghe, 9 X, 1956 (S. AZUMA).

This species is widely distributed in Central and Southern Europe, Northern Africa, Asia Minor and Central Asia to Dzungaria.

11. *Sphex occipitalis* (F. MORAWITZ, 1890) ?

Iran : 1 ♀, Passargadae, 27 VIII, 1956 (K. TAKAYA).

12. *Bembix oculata* LATREILLE, 1808

Iran : 1 ♀, Babul-sar, 25 IX, 1956 (S. AZUMA).

Distribution : Southern Europe, Algier, Asia Minor and Caucasus.

13. *Astata orientalis* SMITH, 1856

Afganistan : 1 ♂, Taiwara, 6 VIII, 1955 (UMESAO).

This species was known only from India and Burma.

## X.

### Diptera Agromyzidae of Afghanistan<sup>1)</sup>

Mitsuhiko SASAKAWA\*

By the courtesy of Dr. R. YOSII of Kyoto University I have had an opportunity to examine the specimens of Agromyzidae in the Kyoto University Karakoram-Hindukush Expedition collection. The specimens are composed of only three species. All the species listed below are the first recorded from Afghanistan.

Before going further, I wish to express my sincere thanks to Dr. R. YOSII for his kindness in lending me the valuable material.

#### Subfamily PHYTOMYZINAE

##### 1. *Phytobia (Poëmyza) lateralis* (MACQUART)

*Agromyza lateralis* MACQUART, Hist. Nat. Insect., Dipt., 2: 609, 1835.

*Dizygomyza (Poëmyza) lateralis* HENDEL, in LINDNER: Die Flieg. palaearkt. Reg., 59: 40, 1931.

*Phytobia (Poëmyza) lateralis* FRICK, Canad. Ent., 85: 70, 1953.

Specimens examined: 1♂ 3♀ ♀, Kabur, Afghanistan, 2. VII. 1955, T. UMESAO leg.

Distribution: Europe, North Africa, Afghanistan, Japan and North America.

##### 2. *Cerodontha denticornis* (PANZER)

*Chlorops denticornis* PANZER, Fauna German., No. 104, fig. 22, 1806.

*Cerodontha denticornis* LIOY, Atti Ist. Veneto, (3) 9: 1315, 1864.

Specimen examined: 1♂, Kabur, Afghanistan, 2. VII. 1955, T. UMESAO leg.

Distribution: Europe, Africa, Asia Minor, Afghanistan, Taiwan (Formosa), Japan and South America.

##### 3. *Phytomyza atricornis* MEIGEN

*Phytomyza atricornis* MEIGEN, Syst. Beschr. bekann. eur. zweifl. Insekt., 7: 404, 1838.

Specimens examined: 3♀ ♀, Kabur, Afghanistan, 2. VII. 1955, T. UMESAO leg.

Distribution: cosmopolitan.

1) Contribution from Entomological Laboratory, Kyoto Prefectural University, No. 82.

\* Entomological Laboratory, Kyoto Prefectural University, Kyoto, Japan.







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